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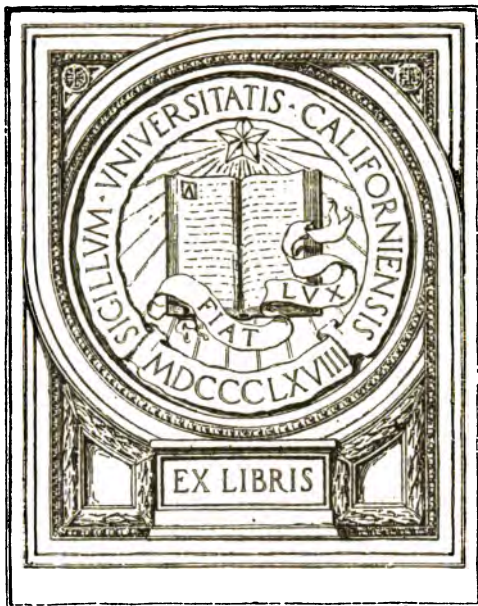
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INSTRUCTIONS FOR MOUNTING,
USING, AND CARING FOR

DISAPPEARING CARRIAGE

L. F., MODEL OF 1905 MII

AND

6-INCH GUNS

MODELS OF 1905 AND 1908

(EIGHT PLATES)

JANUARY 14, 1914



WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

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116
6 in.
1905e

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ABHAYAN

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INSTRUCTIONS

FOR

MOUNTING, USING, AND CARING FOR DISAPPEARING CARRIAGE, L. F., MODEL OF 1905, M₁₁ AND 6-INCH GUNS, MODELS OF 1905 AND 1908.

(Eight plates.)

(The parts in *italics* are of particular importance or concern the safety of the carriage and should be specially noted.)

GENERAL DESCRIPTION.

THE EMPLACEMENT (Plate I).—Emplacements for these carriages are entirely of concrete, and can be arranged for a maximum field of fire of 170°. This limitation is not due to the inability of the carriage to traverse through 360°, but to the requirements of parapet protection for the material and cannoneers. The anchor bolts are set in the concrete during the construction of the emplacement, the depressions for the thrust plates being also provided in the top surface. Access to the counterweight well is given by a vertical shaft in the rear and outside of the base ring.

THE CARRIAGE (Plates II, III, IV).—These carriages are numbered from No. 20 up; they differ from models of earlier dates for mounting the same caliber guns chiefly in having the following features, viz, a single vertical recoil cylinder, increased preponderance of counterweight, a counter-recoil system independent of the recoil system, gears on the recoil rollers.

Stops can be arranged so as to permit traversing either 60, 70, 90, or 110° either side of the "front" of the battery, and the piece can be elevated from 5° depression to 15° elevation, stops being arranged to limit the depression to either horizontal or 2.5° when the height of the parapet requires it.

When, in the execution of mechanical maneuvers, it may become necessary to traverse the piece breech to the front, which can be done with the gun in battery, the fixed stops must be removed and care exercised that the weights do not foul the flexible conduit in the pit and that the carriage is traversed back to the same side so as to take out the half turn given by the breech to the front.

The elevating system is so constructed that the gun is at an angle of about 5° elevation when recoiled to the loading position from any angle of elevation in battery.

ACTION OF CARRIAGE.—Upon firing the piece the gun-lever axle is moved to the rear by the recoiling energy of the gun, carrying the top carriage with it. The lower ends of the levers move vertically upward, being constrained by the crosshead and bottom plate traveling on the vertical guides. The trunnions of the gun move downward and to the rear in the arc of the ellipse. The energy of recoil is absorbed partly by raising the counterweight and partly by the movement of the masses up the inclined chassis rails, but principally by the resistance of the recoil cylinder; and when the gun comes to rest it has the proper loading angle. After loading, the pawls are released by the tripping gear, and the excess of the moment of the counterweight over the moment of the gun, etc., enables it to raise the gun to the firing position.

PRINCIPAL PARTS.—The carriage consists of the following principal parts, namely, base ring, traversing roller system, racer, dust guards, azimuth circle and pointer, chassis and transoms, vertical guides and supporting brackets, top carriage, recoil rollers, counter-recoil buffers, buffer valve, gun levers and axle, crosshead and counterweight, recoil system, retracting gear, tripping gear, elevating system and counterbalance device, traversing system, sighting platforms, sight, lighting apparatus, firing apparatus, and grease cups. The accessories consist of shot trucks, shot tongs, and implements.

BASE RING.—The base ring, 11 feet in diameter, is made of iron cast in one piece and is held in position on the foundation by twelve 1.75-inch bolts. Twelve screws for leveling the base ring are set against steel plates through which the foundation bolts pass.

The base ring, in addition to having the lower roller path on its upper surface, has an annular flange near its inner edge forming the pintle for the carriage. This flange has near its top edge a lip inward under which the three clips engage, and on its top edge the azimuth circle. The inner upper edge of the lip is rabbeted to receive the inner dust guard. The outer annular flange on the ring projects upward outside of the traversing rollers. The cavities on each side of the roller path are drained into the pit.

Tapped holes can be found inside of the pintle flange for attaching the traversing stops in any required position.

The base ring is marked "front" in raised letters cast on the outer annular flange.

TRAVERSING-ROLLER SYSTEM.—The racer rests, and is traversed, upon a circle of 24 live, conical traversing rollers whose axes are maintained in the radial position by bearings bolted to the distance

ring. The rollers are of forged steel, solid, with a journal beyond each end and with flanges on their inner, small ends.

The distance ring is of cast steel, in four sections, bolted together. The bearings for the traversing rollers are formed with a loop on top by means of which any roller with its bearings can be lifted out of the ring through the two holes in the top of the racer.

The system is kept concentric with the pintle by the flanges on the rollers in centrifugal contact with the inner edge of the roller path on the base ring. The inner edge of the path on the racer is of a larger diameter so as not to come in contact with the flanges.

RACER.—The racer is made of iron 10 feet 3 inches in diameter, cast in one piece.

It is of box section, and in addition to having the upper roller path on its under surface, has an annular flange lined with bronze near its inner edge and fitting over the pintle, with 0.04 inch diametral clearance.

Upon its top surface the chassis and transoms are bolted, doweled, and keyed.

An opening sufficiently large for removing a traversing roller is provided at each side of the racer. These holes are habitually kept covered by steel plates provided for the purpose. Four oil holes, passing through the racer, are provided for oiling the pintle surfaces and 14 for oiling the traversing-roller bearings.

Two steel clips secured to the racer near the front and one in the rear engage under the lip inside the pintle of the base ring to prevent possible overturning. The rear clip extends downward, forming also the stop lug engaging the traversing stops and providing a bearing for the traversing pinion shaft.

DUST GUARDS.—The outer dust guard consists of a steel angle in four sections with its horizontal flange bolted to the outer part of the base ring. To the vertical flange is clamped a projecting strip of felt which bears against a finished surface on the underside of the racer.

The inner dust guard is formed similarly by a strip of felt clamped to the inner upper portion of the base-ring pintle.

These guards exclude dust from the traversing rollers and roller paths. The dust-guard sections with their felt strips are easily removed.

AZIMUTH CIRCLE AND POINTER.—A brass azimuth circle, attached by countersunk screws to the top of the pintle of the base ring, is graduated in degrees, the numbers of which are to be added after the carriage is erected in its emplacement. The top of the racer is cut away on the right side to expose the azimuth circle and the micrometer pointer and the subscale, fastened to the racer. The subscale has slotted holes to give it a lateral motion for adjustment, after

which it is fixed in position by two screws. It is graduated and stamped in decimals of a degree, the least reading being 0.1 of a degree. The micrometer screw, actuating the pointer, is graduated to a least reading of 0.01 of a degree. The subscale and pointer are protected by a hinged bronze cover.

To adjust the azimuth pointer, point the gun by the bore sights on a target, the exact azimuth of which is known, set the pointer to read the hundredths of a degree in the azimuth reading, loosen the securing screws, move the pointer bodily until the reference mark on its moving part exactly coincides with a degree mark on the azimuth circle, then secure in position. The degree mark should be stamped with the number indicating the azimuth bearing in degrees and the remainder of the azimuth circle should be stamped with numbers from this point as a reference.

CHASSIS AND TRANSOMS.—The chassis of cast iron are bolted, doweled, and keyed to the racer and are united at their front and rear ends by cast-steel transoms, also bolted to the racer. The rear transom carries the elevating slide and gearing. The upper surfaces of the chassis form the recoil-roller path and slope 1 degree and 20 minutes to the front to facilitate the return of the piece to the firing position, thus reducing the necessary preponderance of the counterweight.

Four forged-steel racks, in which the gears on the recoil rollers engage, are secured to the upper surfaces of the chassis, one on each side of each roller path. *These racks are not to be removed.*

The chassis also provide the necessary bearings or supports for all the mechanism and, with the racer, supports for all the minor attachments.

VERTICAL GUIDES.—A cast-iron guide frame is bolted to the underside of each chassis opposite the counterweight. The lower ends are joined by the piston-rod beam. The inner faces of the guide frames and chassis form continuous finished surfaces, to which are bolted two vertical guides for the crosshead and bottom plate, which extend above the chassis and are supported by brackets bolted to it.

TOP CARRIAGE.—The top carriage is of cast steel, in one piece. It consists essentially of two side pieces, united by a transom. Two bronze-bushed bearings for the gun-lever axle are formed in the upper part, to which the axle caps are bolted. On the underside are two roller paths. Four steel racks, in which the gears on the recoil rollers engage, are secured by screws to the underside of the top carriage, one on each side of each roller path. *These racks are not removable.*

Recesses are cast in each side of the top carriage near the front, in which pinch bars, inserted through openings in the guide brackets

can be engaged to force the top carriage forward against the stops, if for any reason it should fail to return fully into battery.

RECOIL ROLLERS AND ROLLER CAGES.—The top carriage rests on 18 live recoil rollers on each side, held in alignment by steel roller cages. They move to the rear with the top carriage at half its speed. The recoil rollers are of forged steel and each alternate one has flanges which serve as guides. Each flanged roller is provided with gears which engage in the racks on the top carriage and chassis and which prevent skidding of the top carriage during recoil.

COUNTER-RECOIL BUFFERS.—A counter-recoil buffer is fitted to the forward end of each chassis roller path. The buffer cylinder is securely bolted to the chassis, and on the rear face of the cylinder casting a stop is machined, against which a corresponding machined surface on the forward end of the top carriage abuts when the gun is fully in battery.

Each end of the counter-recoil buffer cylinders is closed by a stuffing box fitted with hydraulic packing. Twenty-four rings of packing are furnished for each carriage, five for each stuffing box and four rings for replacements.

Each cylinder is provided with a filling plug located on the top, in front of the piston head in its rear position. A bronze plate, with instructions as to filling the cylinder, is secured by screws near the filling plug.

Two holes extend through the wall of the cylinder from the lowest element of the bore, at an angle of 45° downward. To these openings are coupled the pipes connecting with the buffer valve.

The openings are located longitudinally, one just in front of the rear stuffing box, so that it is always in rear of the piston head; the other 2.125 inches in rear of the front stuffing box.

The piston extends through both stuffing boxes. The piston head, located approximately in the middle of the piston rod, is bronze lined and has a diametral clearance in the bore of 0.008 inch, which fact necessitates the passage of oil from one side of the piston head to the other during rapid movement, principally by way of the buffer valve, and very little directly past the piston head.

On the exterior of the buffer cylinder at its forward end are cast two lateral horizontal lugs, one on each side. Annular projections are formed on their rear faces, centering and supporting the buffer-spring covers and buffer springs, which extend to the rear alongside the hydraulic cylinder. In the center of these projections are holes through which the buffer-spring rods pass.

The buffer-spring rods, of steel, are both attached at their forward ends to a buffer yoke, of cast steel, which is attached at its middle to the forward end of the buffer piston.

The rear ends of the spring rods are attached to buffer-spring supports, which consist of steel sleeves, inclosing the rods, with flanges at their rear ends fitting easily in the interior of the spring covers and supporting the rear ends of the springs. Collars are machined on the buffer-spring rods, which, by seating against the front face of the buffer-cylinder casting, limit the rearward movement of the piston and parts connected to it. A piston movement of 9 inches is provided for.

The action of each counter-recoil buffer is as follows: When the gun is out of battery, the buffer springs, acting against their fixed supports in front, force the spring supports, spring rods, yoke, and piston rod to the rear until stopped by the collars on the spring rods. The buffer piston head in this position is 0.75 inch in front of the rear stuffing box. The rear end of the piston rod projects 9 inches in rear of the stop of the top carriage when in battery.

When the gun rises into battery the top carriage strikes the projecting end of each piston rod and forces it to the front, compressing the buffer springs.

For the first 7.5 inches of piston movement the oil in front of piston, being displaced, passes through the forward opening in the bottom of the bore to the buffer valve and returns to the cylinder through the rear opening. The forward opening is at this point closed by the piston head and for the remaining 1.5 inches of piston movement the cylinder acts as a dashpot, it being possible for oil to escape only around the piston head. Unless the energy of the top carriage, etc., is too great at the end of 7.5 inches of movement, due to the buffer valve not being correctly set, they will be brought to rest against the stops without jar to the carriage.

If for any reason the retracting clutches should fail to retain the gun out of battery after recoil, it is necessary, to prevent jar to the carriage, that the buffer pistons reach their rearward position before the top carriage strikes them, in order that they may do the full amount of work of retardation. The buffer springs have been designed to accomplish this, assuming that the stuffing boxes do not offer an unreasonable frictional resistance. *It is therefore important to screw up the glands only sufficiently to prevent leakage.* From the foregoing description it is evident that it will be necessary to tighten the front stuffing box more than the rear one.

BUFFER VALVE.—Both counter-recoil buffers are joined to the buffer valve, the different settings of which enable the energy of counter recoil to be absorbed without shock to the carriage under varying conditions affecting the velocity of counter recoil. Aside from mechanical difficulties and those due to differences in the elements of loading, the following sources of variation may be mentioned: Atmospheric temperature, affecting the oil in both recoil and buffer

cylinders; specific gravity of this oil (prescribed 0.85), and the loading position.

The equalizing and throttling pipes serve to connect the buffer valve to the buffer cylinders, to equalize the pressure in the buffer cylinders, and to facilitate filling them. Four plugs are furnished to close the buffer cylinders in case these pipes are damaged in action.

The buffer valve is located at the top of the oval opening in the front transom, to which it is attached by two bolts. It is accessible from the front of the carriage.

It consists essentially of a valve body, gland, disk, and handle of bronze, and a stem of steel and bronze.

The body which supports the other parts and provides means for attachment to the front transom has two T-shaped chambers. The horizontal branches are coupled to the equalizing and throttling pipes, the upper leading to the forward ends of the buffer cylinders and the lower to the rear ends. The vertical branches overlap, that of the upper chamber being in front of that of the lower chamber. A horizontal hole extends from the front of the body through the vertical branch of the upper chamber and through the wall between the two branches to the rear chamber. In the hole through the wall between the chambers is screwed a steel valve seat which has a central hole enlarging in the front face into a conical seat for the point of the valve stem. The larger part of the oil displaced in the counter-recoil buffers during counter recoil passes through this hole.

Just in front of the front and upper chamber, the hole is threaded to receive a corresponding threaded portion on the valve stem. So that if the stem be turned clockwise, its conical point will bear on the valve seat and close the valve; if the stem be turned counter-clockwise, the opening about its point will increase and may reach a maximum of about 0.056 square inch.

The disk is fixed to the body concentric with the stem. On the front face is an annular flange with 82 internal teeth, in which 3 corresponding teeth on the handle engage in order to retain the valve at any desired setting. The teeth on the disk are numbered counterclockwise from 0 to 80 at intervals of 5 teeth. A pin set in the face of the disk prevents the handle being turned more than 360 degrees.

The handle is a bar with a rectangular hole in the middle which fits on a corresponding portion of the stem. At one end is a pointer with teeth which engage in the teeth of the disk. An index line on the handle permits accurate setting at any desired tooth. The rectangular portion on the stem is so laid out that the handle engages at 0 of the disk when the valve is closed. The handle can be moved along the stem to permit disengaging the teeth when changing the setting. A padlock is provided in order that the valve setting may not be tampered with by unauthorized persons.

When the carriage has been erected at the fortification and a thorough knowledge obtained of its characteristics in counter recoil, under all conditions, the disk should be stamped, under the direction of the Ordnance Department, at the proper points of the annular space provided for this purpose, with the words "Very hot," "Hot," "Warm," "Medium," "Cool," "Cold," and "Very cold," to facilitate setting the buffer valve.

A stuffing box is formed in the body around the stem, in which four rings of packing are placed.

An emptying plug is located at the bottom of the valve body which serves to drain the buffer cylinders.

The setting of the buffer valve is best determined by trial. The setting of the recoil valve should be considered in setting the buffer valve. With a higher setting of the recoil valve, counter recoil will be more free, and consequently the buffer-valve setting should be lower. The following data are given as a rough guide in setting the buffer valve before more definite knowledge has been gained by trial:

Atmospheric temperature, °F.	Buffer-valve setting.
0 to 30	80 to 45
30 to 60	45 to 20
60 to 80	20 to 15

The counter recoil should be regulated by settings of the counter-recoil buffer valve and not by adding or removing counterweight.

GUN LEVERS AND AXLE.—The gun levers support the gun at its trunnions in bronze-bushed bearings at their upper or rear ends; and the crosshead, counterweight, bottom plate, and recoil cylinder in bushed bearings at their lower or forward ends. The arms of the axle pass through the bores in the gun lever, project beyond them, and rest in the bearings of the top carriage.

CROSSHEAD AND COUNTERWEIGHT.—The crosshead is a steel casting which serves to attach the counterweight to the gun levers, and through the guide clips bolted to both sides of it, together with similar clips cast on the bottom plate, constrains the counterweight to move vertically, preserving the alignment of the recoil cylinder.

The gun-lever pins of forged steel are inserted from the inside of the crosshead through the bearings in the gun lever. A key covers a segment of the inner end of each, and is secured at both ends to the face of the bearing in the crosshead, serving to prevent the gun-lever pin from working out of place. A tongue on this key rests in a groove in the gun-lever pin and prevents rotation. Each pin is tapped axially at its inner end to receive the extractor used to withdraw it.

The guide clips are keyed longitudinally to the crosshead, and are secured by bolts pinned and permanently finished in place.

On the front face of each guide clip is machined a rack in which pawls pivoted to the chassis rails engage, thus preventing the gun from returning to the firing position after recoiling or being retracted.

There is a finished hole in the center of the crosshead in which the upper end of the recoil cylinder fits closely for alignment.

In each corner of the crosshead are bored vertical holes through which the four suspension rods depend. These rods are secured to the crosshead by castellated nuts with split pins which draw the shoulders on the rods firmly against the finished under surface of the crosshead. In a similar manner there is attached to the lower ends of the rods the bottom plate, on which rests the counterweight and to which is attached the recoil cylinder.

Guide clips are cast on the bottom plate which correspond to those attached to the crosshead.

On the bottom plate is piled the counterweight, consisting, when mounting 6-inch gun, model of 1905, of eleven cast-iron weights; six are about 4,000 pounds each, forming the first six layers. The seventh layer consists of three weights, a total of about 2,000 pounds, the inner placed under the crosshead with an outline and upper surface corresponding to the rods on the crosshead, and two outer ones held in place by T slots, which engage over similar projections cast on the front and rear sides of the crosshead. The eighth layer of about 1,500 pounds consists of two weights in front and rear of the crosshead of the same shape as the outer weights of the seventh layer and held in place by projections on the bottom, which seat in depressions on the upper surface of the weights below.

The eighth layer and the outer weights of the seventh layer can be removed without disturbing the crosshead; the others can not.

It is not intended that counterweight should be removed or added to regulate counter recoil, and none is provided for this purpose.

The total weight attached to the gun levers, including crosshead, counterweight, bottom plate, and recoil cylinder filled with oil, is about 35,000 pounds. The counterweight alone is approximately 27,000 pounds. The preponderance of the weight of the counterweight, etc., over the weight of the gun is approximately 14,000 pounds.

When 6-inch gun, model of 1908 (wire wrapped), is mounted, only four weights are used, viz., the first three layers, and a special layer, the latter having the same outline but less depth. The fourth layer weighs about 2,800 pounds.

The total weight attached to the gun levers, including crosshead, counterweight bottom plate, and recoil cylinders filled with oil, is about 22,600 pounds. The counterweight alone is approximately 14,600 pounds. The preponderance of weight of the counterweight, etc., over the weight of the gun is approximately 10,000 pounds.

RECOIL SYSTEM (Plate V).—The energy of recoil is absorbed principally by a single vertical hydraulic cylinder moving with the counterweight and a piston and rod secured at its lower end to the middle of the piston-rod beam.

Recoil is varied to meet varying conditions of atmospheric temperature, velocity of projectile, etc., by means of a recoil valve contained in the piston rod.

The principal parts of the recoil system are: The recoil cylinder, the upper and lower cylinder heads with stuffing boxes, drain plug, filling plug, piston and rod, valve stem and body, locking disk, hasp and hasp bracket, piston-rod bracket, and recoil indicators.

The recoil cylinder has two throttling bars bolted to its inner surface at opposite ends of a diameter. The bars are of variable cross section in order to oppose a constant resistance to the energy of recoil of the carriage. The piston is slotted to receive the throttling bars; the area of the orifice will vary with the position of the piston. The two ends of the cylinder are closed by the upper and lower cylinder heads.

Narrow copper gaskets $\frac{1}{8}$ inch thick, seated in recesses at both ends of the cylinder, are compressed in securing the cylinder heads sealing the joints against oil pressure.

Around the bore of each cylinder head a stuffing box prevents the escape of oil by the piston rod. Each stuffing box requires 6 rings of hydraulic packing 0.5 by 0.5 inch square. Eighteen rings are issued with each carriage, 6 being for reserve.

In the lower cylinder head is a recess 5.25 inches in diameter. On the piston below the head is a corresponding enlargement which enters this recess with slight clearance. If at the end of recoil the energy has not been normally absorbed, these parts, acting as a dash pot, provide a safeguard against possible injury to the carriage.

The filling and drain holes are in the upper and lower cylinder heads, respectively. The filling plug is in the form of a tap bolt; one additional is supplied. The drain plug is so arranged that the oil can be withdrawn from the cylinder without unscrewing the plug more than a few turns. A brass gutter is bolted to the piston-rod beam under the plug for the purpose of conducting the oil within reach of the receptacle.

The piston and rod are of forged steel in two pieces, the lower part of the rod being formed in one piece with the piston. The lower end passes through a hole in the piston-rod beam. Two nuts engage on threaded portions of the rod above and below the beam, cylindrical portions on them seating in counterbores in the beam; thus aligning the rod. The upper nut is secured by a taper pin; the lower is castellated and secured by a split pin.

The upper end of the rod is bored axially to receive the stem and body of the recoil valve. At the piston two grooves surround the bore. Four holes radiate from each of these grooves, one set opening on each side of the piston. Oil can therefore pass from one side of the piston to the other in three ways, namely, by the outside of the piston head, through the diametral clearance of 0.02 inch, through the orifices between the throttling bars and the slots in the piston, and through the two sets of radial holes.

Passage through the radial holes is restricted by the recoil valve body. This is a bronze bar fitting closely in the piston-rod bore opposite the piston. It has a diametral slot 0.4 inch wide, 1.625 inches long, and 1.375 inches from the lower end. With the recoil valve open this slot reaches from one groove to the other. As the valve body is withdrawn upward the portion of the slot open to the lower groove decreases to zero, when the passage between the two sets of radial holes is closed.

At the upper end of the piston a bronze valve-stem nut is screwed into the bore and secured by a nut-locking screw. A slot in the upper end of this nut affords means of removing and inserting it with the tit wrench provided for this purpose.

The valve stem is a steel rod connecting the valve body with the valve-stem nut for the purpose of actuating the former. The upper end of the valve stem has a flatted portion, over which the locking disk is seated and on which the wrench for the recoil valve engages. This wrench is provided on one end of the tit wrench for the valve-stem nut. In order to remove the valve, the valve-stem nut must be taken out.

The locking disk is of steel, 3.5 inches in diameter, and has 11 notches on its circumference to indicate the open, closed, and nine intermediate positions of the recoil valve. The notch corresponding to the closed position of the valve is stamped "Closed." The remaining 10 notches are equally spaced and numbered counterclockwise from 1 to 10.

When the shoulder on the valve stem stops against the lower end of the valve-stem nut, the "closed" notch is toward the front of the carriage and opposite the hasp and the bottom of the slot in the valve-stem body is 0.25 inch above the lower groove in the piston-rod bore. When the disk is turned clockwise 90° , the valve stem descends 0.25 inch and brings the bottom of the slot to coincidence with the upper edge of the lower groove. A further movement of 18° uncovers the lower groove 0.05 inch, or an area of 0.02 square inch, and brings the first notch of the locking disk opposite the hasp. Similarly each additional notch opens the passage through the piston 0.05 inch. When the tenth notch is opposite the hasp, the lower groove is uncovered 0.5 inch, and the valve is open.

The upper end of the piston rod is flatted to retain it in a fixed position with respect to rotation. A piston-rod bracket of cast steel maintains the upper end of the piston rod in alignment. The hasp bracket is bolted to the piston-rod bracket in front of the piston rod, seating against the flatted portion on the latter. The hasp, by engaging in notches on the locking disk, retains the recoil valve at any desired setting. A flange on the top of it prevents the locking disk from moving vertically when the hasp is engaged. A slot in the hasp passes over a lug on the hasp bracket, after which a padlock is secured to the lug, preventing any unauthorized change in the setting of the recoil valve.

A filling-plug instruction plate is secured to the crosshead near the filling plug, so as to be visible from the front of the carriage.

The normal recoil is 47.8 inches; 4.2 inches additional recoil is provided for. During this additional recoil, the recoil buffer previously described would act to bring the carriage to rest without shock.

A bronze scale 32 inches long is secured to an angle iron on each side of the crosshead joining the guide clip with the bottom plate. Numbered graduations are cast upon it at intervals of 1 inch, from 25 to 52, inclusive. A pointer to indicate the recoil is secured to the inside of each chassis. The pointers and scales are visible through round openings in each side of the chassis.

The recoil valve is the only means provided for varying the length of recoil, *and no attempt should be made to use other means for this purpose. Although the setting of the recoil valve slightly affects counter-recoil, it should not be used to regulate the latter movement.*

When more definite data are not available, the valve setting for the first round at full charge should be:

Atmospheric temperature.	Recoil-valve setting.
Below 30° F.....	9
30° to 70° F.....	8
Above 70° F.....	7

A careful record should be kept of recoil-valve settings for each carriage in a form convenient for their study for guidance in future firings.

For firings with all charges, the recoil cylinder should be filled to the level of the filling hole with the oil issued for this purpose, and frequent inspections should be made of the lower stuffing box during firing to guard against leakage of oil. If escape of oil occurs, the cylinder should be refilled and the cause of leakage remedied.

RETRACTING SYSTEM.—The retracting system enables the gun to be retracted from the firing to the loading position when desired. The effort required is least at the start and steadily increases.

Retraction is by hand power only, power being applied to cranks on each side of the carriage. The extremities of the shaft on which the cranks engage are flat on three sides, and the cranks are secured by two split-pin fastenings, making them easily removable.

The retracting cranks should be removed and placed on the chassis hooks provided for them when they are not actually in use.

The retracting crank shaft actuates, through a train of two pairs of spur gearing, two drums, to which are fastened by corrugated clamps two wire ropes, which wind upon the drums. A ratchet and pawl on the right end of the retracting crank shaft prevents the load from overhauling the gearing. From the drums these ropes pass around guide pulleys in the rear ends of the chassis, and are hooked to the upper end of the gun levers. These ropes remain with the carriage, and when not in use are wound upon the drums until the ropes project but a short distance beyond the guide-pulley brackets.

In hauling down, care should be taken to see that the ropes are under *equal tension*. After taking up the slack in the ropes, and putting some strain on them, they should be vibrated slightly, and if found to be unequally loaded adjustment should be made at the rope clamps on the drums. After the loop of the rope is passed over the hook on the upper end of the gun lever, and while winding up the slack, especial care should be taken that the rope is guided to the pulleys without any kinks or any slack and that the coils lie smoothly upon the drums without crossing the ridges between the grooves.

The wire ropes should always be detached from the gun-lever hooks before tripping.

Bearings of the shafts of the retracting gearing are provided with roller bearings. Longitudinal motion is in general prevented by thrust collars pinned to the shaft and having grooves fitted with felt to protect the bearings from dust. Ample means of lubrication are provided, and *it is important that parts of the retracting gearing be kept well lubricated.*

RETRACTING CLUTCH AND BRAKE.—To permit the most rapid overhauling of the wire ropes possible there is provided a spring engaging claw clutch for rotating the drum shaft from the drum shaft gear in retracting. With the clutch disengaged the ropes can be drawn out quickly, revolving the drums and drum shaft rapidly in the drum-shaft gear. The clutch is disengaged by pushing in the loop handle on the left and giving it a quarter turn, which locks the clutch out with the spring compressed.

In order to prevent overrunning and injury to the ropes a band brake is added, gripping a brake wheel keyed to the drum shaft upon lifting a brake lever. This is on the left of the carriage. When enough rope has been overhauled the brake handle is raised to stop the shaft, the loop handle is given a quarter turn back to permit the

clutch to engage, and the spring moves the clutch on its feathers in the drum shaft to engagement.

TRIPPING GEAR.—The tripping gear is for the purpose of releasing the pawls from the racks on the guide clips, permitting the gun to return to the firing position; of automatically holding the pawls released until the counterweight has descended sufficiently for the top of the racks on the guide clips to be below the pawls; and of automatically releasing the pawls, permitting them to reengage when the gun recoils or is retracted.

The tripping gear consists of the following principal parts: Tripping lever and shaft; tripping crank and link; locking lever and link; tripping-lever latch; safety latch; safety-latch dog (on front face of left guide clip, to right of rack); and pawls.

The tripping lever is located outside of the front end of the left chassis, and is keyed on the end of the tripping-lever shaft. This shaft extends across the front of the carriage and rests in bronze bushed bearings in each chassis. Vertical rotation upward of the tripping lever is limited by the safety latch. Downward rotation of the tripping lever is limited by a stop bolted to the racer.

To prevent injury to the carriage from tripping the gun when the buffer pistons have not been returned to the rear by the buffer springs, a tripping-lever latch is provided, which is connected through the locking lever and link to the buffer yoke. The latch engages the tripping crank and prevents lifting the tripping lever till the buffer yoke has completed 7 inches of the 9-inch movement to the rear, when the latch is disengaged and the gun may be tripped. To trip the gun the lever is moved upward as far as it will go, which will bring it about horizontal. This disengages the pawls from the racks, and the safety latch, catching the end of the pawl lever, holds the pawls away from the racks during the descent of the counterweight till released by the dog on the left guide clip. The safety latch is not released till the tops of the racks are below the pawls. When the dog releases the safety latch, the tripping lever is returned by its own movement to its normal position against the stop. The pawls are then ready to engage the racks when they again rise.

THE ELEVATING SYSTEM (Plate VII).—The gun is moved in elevation by turning an elevating handwheel, located on the left side of carriage, which is connected through its shaft and bevel gears to a screw fixed to the rear transom. A moving nut on the screw is connected with the lower end of the elevating arm, whose upper end is attached to the gun 66 inches in rear of the trunnion.

The elevating system consists of the elevating band and arms, slide, slide nut, slide spring, screw, shaft gear, shaft and handwheel; also pinions, intermediate gear, intermediate pinions, elevation disk

gear, elevation disk pointer, spiral spring, and the counterbalance device.

The elevating band seats in a groove in the gun. On the extremities of a horizontal diameter are band trunnions which are inserted after the elevating arm is in position.

The elevating arm is connected at its lower end to the elevating slide by means of the elevating pin, which is inserted through bronze bushed bearings in the slide and through a hole in the elevating rod; at its upper end it is connected to the elevating band.

The elevating slide consists of two side pieces connected by transoms. Along the lower edges are bronze-lined flanges. In the rear transom are planed guideways for these flanges. The slide is held in place by two cast-steel gibs bolted to the rear transom. To the side of the right guideway is bolted the elevating stop.

Due to the severe downward shock received through the elevating arm when the gun is fired, the thrust is transmitted from the elevating slide to the slide nut by a helical spring surrounding the slide nut. It is compressed between the flange on the lower end of the nut and the upper transom of the elevating slide. In order that the elevating slide and slide nut shall have the same relative position at all times, except when the spring is compressed by firing, a spring-compressing nut is screwed into the lower transom of the slide, with its upper end bearing on the bottom of the slide nut. The spring-compressing nut is set up so as to give the spring an initial compression, which will positively return the compressing nut to a bearing against the slide nut after the spring is compressed by firing. This initial compression is given during the shop test of the carriage, and a taper pin is inserted in the elevating slide through a hole in the flange on the head of the compressing nut. *In case the nut should later be removed, care must be exercised that it be returned to exactly its original position, as the 0 of the elevation scale will otherwise be thrown out of adjustment.*

The elevating shaft is located at the rear and left side of the carriage. It rests in three roller bearings, one in the left chassis and two in lugs cast on the middle of the top of the rear transom. To the outer extremity is keyed the elevating handwheel shaft of wrought iron with cast-iron hub. Between the two inner bearings of the shaft is keyed a forged steel elevating shaft bevel pinion engaging in the gear on the elevating screw.

The elevation disk and pointer are for the purpose of indicating the elevation of the gun, both in degrees and yards of range, for a given weight of projectile and muzzle velocity. It consists principally of a German silver disk, range and elevation scales, pointer base, pointer, and spring.

The elevation disk of German silver is graduated in yards of range, service velocity, on its outer circumference; on its inner circumference appear graduations for yards of range with subcaliber ammunition; the elevation scale is graduated at 5° intervals, the graduations being between the two range scales. The interval of graduations for range scales is 20 yards; range scales to be graduated after piece is mounted in emplacement, from data furnished by the Ordnance Department; elevation scale to be graduated in shop by use of clinometer.

The elevation disk is secured to the face of the elevation disk gear by 24 German silver screws, and is rotated by means of the train of gears upon changing the elevation of the gun. A spiral spring, assembled under tension, takes up all back-lash in the gears.

The pointer base is bolted to the left chassis, and serves as a support for the pointer. The latter is of bronze, with an approximately rectangular opening for viewing the scales. Three German silver strips for zero marks are dovetailed and pinned in place. A correction screw with knurled head, turning in a seat in the pointer base, engages teeth on the outer circumference of the pointer, thus providing a means of correcting the scale by shifting the index.

The counterbalance device tends to equalize the force required for elevating and depressing, with the gun in the loading as well as in the firing position. A cast-iron cylindrical weight of 580 pounds is suspended by means of an equalizing bar fork extending through it axially from the equalizing bar. To the extremities of the latter are attached the ends of the rope. Its bight passes over two pairs of guide sheaves to the upper end of the guideways of the rear transom, thence to the lower end of the elevating slide nut, to which it is secured by two clamps bolted to the slide nut.

The weight descends vertically into the counterweight well as the gun is depressed.

All gears of the elevating system are provided with cast-iron gear covers in halves bolted together. Oil plugs in them provide easy means of oiling the gears. Roller and other bearings are also provided with ample means of lubrication.

TRAVERSING SYSTEM.—The traversing system enables the racer and parts supported by it to be easily and quickly moved in azimuth on the traversing rollers, either from the working platform or from the sighting platform.

Traversing is accomplished by rotation of the traversing pinion, which is attached to a vertical shaft at the rear of the carriage and engages in a steel rack fixed to the interior of the base ring.

The traversing system consists principally of gearing for rapid movement from the working platform at the right side of the carriage and of slow-motion gearing for smooth slow movement, as in

following a target. It is composed of traversing rack, pinion, pinion shaft, crank shaft, and gears.

The traversing rack is of six sections joined in such a manner that they can be easily removed individually and secured to the base ring by 60 screws set below the surface of the bottom of the teeth. Traversing pinion is keyed and secured by a castellated nut to the traversing pinion shaft. The latter has two roller bearings and one ball-thrust bearing in the rear clip and traversing bracket, which is a steel casting bolted to the rear transom and to the racer. It also provides two roller bearings for the traversing crank shaft, to which is keyed a forged steel traversing crank shaft bevel pinion, which engages in a cast-iron gear keyed and secured by castellated nut to the upper end of the traversing pinion shaft. A traversing crank is secured by a split pin to the right extremity of the crank shaft outside of the chassis. The traversing crank is easily removable, and hooks for it when not in use are provided on the chassis.

The slow-motion traversing gearing consists essentially of a hand-wheel, shaft, and gears; intermediate shaft; clutch gears, plunger, rod, fork, and fork lever; foot lever; spring stirrup and spring, and the necessary bearings. The handwheel is attached to the right end of its shaft, which is connected to the traversing intermediate shaft. The intermediate shaft is keyed to a bevel gear, which engages in a pinion secured to the handwheel shaft near the handwheel. The upper end of the intermediate shaft is supported by a ball-thrust bearing in the upper traversing bearing, which is bolted to the sight standard. The lower end of the intermediate shaft passes through a bushing in the lower traversing bearing which is bolted to the left chassis at the traversing crank shaft. There is keyed to its lower extremity a forged-steel clutch bevel pinion. The cast-iron gear in which it engages is bronze bushed and is free to rotate on the traversing crank shaft. The traversing clutch is a bronze collar having a sliding fit over two keys on the crank shaft to the left and outside of the clutch gear. Six 30° lugs on its right end engage between corresponding ones on the left end of the hub of the gear.

The clutch mechanism is for the purpose of moving the clutch in and out of engagement with the clutch gear. When engaged the rotation from the sighting platform of the clutch gear is transmitted to the crank shaft and traversing pinion; when disengaged the crank shaft can be rotated in the bushing of the clutch gear without movement of the slow-motion gearing. It is operated from the sighting platform by pressure of the foot on a plunger which actuates a series of levers, moving the clutch into engagement; releasing the foot pressure causes the disengagement under the action of the clutch-rod spring, which returns the plunger to its original position.

All gears of the traversing system are provided with gear covers. Oil holes are provided for lubrication.

SIGHTING PLATFORMS.—Two sighting platforms are provided, one on each side of the carriage. Means for traversing only are provided by a handwheel operated from the left platform.

SIGHT.—The sight with which carriages Nos. 20 and 21 are equipped is the 3-inch telescope sight, model of 1904, which, together with its cradle and sight arm, is described in Form 1955. The sight arm is mounted on a sight-arm bracket, which is in turn mounted on the upper end of the sight standard.

The sight standard is of cast steel. The upper end of the sight standard is turned to a diameter of 6.497 inches for a height of 6 inches, below which is a flange with two set screws in front screwed into lugs 2.5 inches apart. The sight-arm bracket is of cast steel with a socket at the rear bored to fit the upper end of the sight standard. An arm projects to the front 25.44 inches, having at the extremity a double bearing for the sight-arm bracket pin which passes through the hole in the forward end of the sight arm. A lug at the base of the sight-arm bracket is engaged by the set screws of the sight standard, which enables the line of sight to be brought into exact parallelism with the bore of the gun with respect to azimuth. To make the adjustment, point the gun at a distant object (about 6,000 yards away, if practicable) by means of a bore sight, set the deflection scale of the telescopic sight at 0, then bring the sight on the target by means of the set screws. Four tap bolts are screwed into the sight standard through holes in the flange at the base of the sight-arm bracket. These holes are 0.188 inch in diameter larger than the bolts, which allows sufficient play to make the desired adjustment, after which the screws should be tightened and the adjustment verified.

Two lugs project upward from the rear of the sight-arm bracket and afford a double bearing for a second sight-arm bracket pin passing through the sight arm. In this case the cradle movement in elevation is merely for the purpose of bringing the target into the field of the telescope.

Carriages after No. 21 are equipped with 3-inch telescopic sight, model of 1912, described in pamphlet No. 1959. The cradle yoke is mounted on the sight bracket, which is in turn mounted on the sight standard.

The sight standard for these carriages is capped by a round flange 12 inches in diameter, to which the cast-steel sight bracket is bolted. The cradle yoke is bolted to the sight bracket, and adjustment in azimuth for bore sighting is provided for by elongated bolt holes in the rear end of the sight bracket.

ELECTRICAL EQUIPMENT (Plates VI and VII).—Plates VI and VII show the plan of the electrical equipment and the wiring diagram.

LIGHTING CIRCUITS.—The power for lighting is obtained from the power mains of the emplacement through lead-covered cables which enter a terminal box at the rear of the pit. From that point it is distributed by insulated wires with flexible metallic and insulated wrought-iron pipe conduits to four 8-candlepower lamps, one at the azimuth pointer, one at the elevation pointer, one at the recoil valve, and one at the buffer valve; to three 16-candlepower lamps, one on each chassis and one at the rear transom; to one portable 16-candlepower lamp at the rear end of the right transom; and to two 2-candlepower lamps on the telescopic sight. The 2-candlepower lamps are for the illumination of the cross wires and the deflection scale. All lamps are 110 volts, in parallel. Where emplacements are equipped with power at 220 volts, lamps are placed in parallel series of two lamps each.

The azimuth and elevation pointer lamps and the buffer and recoil valve lamps, as well as those for illuminating the sight, are controlled by a single snap switch on the lamp fitting of the elevation pointer lamp at the rear of the carriage; the chassis lamps and the lamp at the rear transom are provided with key sockets for their control. The portable lamp has a snap switch on its base. Cross wires of the sight are provided with a mechanical dimmer, by which the lamp is occulted to any desired degree.

The portable water-tight lamp is for general use within the limit of its reach. The lamp itself is covered by a globe of heavy glass seated in a bronze base, to which is attached a handle. The flexible steel conduit containing the conductors passes through this handle. A substantial wire guard surrounds the globe and is attached to the base.

FIRING CIRCUITS.—The gun may be fired either electrically or by lanyard. The current for firing electrically is obtained either from a battery of dry cells carried in a box supported in a bracket attached to the underside of the sighting platform, in which case the firing circuit is closed through a firing pistol mounted on a bracket bolted to the upper traversing bearing, above the left sighting platform, or from a hand-operated alternating current magneto mounted on the firing-pistol bracket in place of the firing pistol, the dry-cell battery being dispensed with.

When using the battery the gunner may determine whether the circuit is complete without actually firing a primer by pressing a projecting button on the pistol, thereby closing the firing circuit through a coil of high resistance, which, with the voltage ordinarily used, permits the passage of sufficient current to operate a buzzer, but not sufficient to endanger the firing of the primer.

A circuit breaker on the breech of the gun prevents the possible firing of the gun electrically except when the breechblock is fully

closed whether the gun be in the loading or in the firing position. A safety firing switch on the carriage prevents the possible firing of the gun electrically except when fully into battery or nearly so. This device consists of a double-pole, single-throw switch, the parts of which are separated by the recoil, one part being attached to the chassis, the other part to the top carriage. The part attached to the chassis is so arranged that when the top carriage recoils it drops out of position, so that on counter recoil contact is not made until this part is raised into position by a lever on the outside of the left chassis.

The gun is fired by lanyard from the loading platform. A safety device has been added to prevent the possible firing of the gun by lanyard except when fully in battery or nearly so. The device consists of a short lanyard running from the primer to a ring at the end of a copper cable wound on a reel. The reel is carried in a housing attached to the rear face of the elevating band on the gun. One end of the firing lanyard is attached to the ring on the copper cable, the other is held by the cannoneer who is to fire the piece. The short lanyard can be pulled to the rear so as to fire the primer only by first unwinding the copper cable from the drum. This is prevented while the gun is from battery by the action of a pawl which engages a ratchet on the drum. When the gun rises into battery, this pawl is automatically tripped by a cam attached to the rear face of the elevating arm. This permits the reel to be unwound and the pull to thus come upon the short lanyard attached to the primer.

The reel is provided with a spiral spring which causes it to rotate and wind up the copper cable as soon as the pull upon the lanyard is released. The initial tension of this spring should be such as to cause the copper cable to be wound up with certainty with the lanyard attached. Should the initial tension be much in excess of the proper amount, the spring may become wound solid before sufficient cable has been unwound to permit the firing of the primer. Too much tension on the spring is otherwise objectionable, since it brings unnecessary strains on the parts when the reel automatically winds up.

Should the tension of the spring require adjustment, it may be done as follows: Loosen the nut on the spring shaft projecting from the center of the case; hold with a screw wrench the square end of the shaft to prevent the spring from unwinding; remove the spring shaft pin, and, by means of the wrench, turn the spring shaft in such direction as to increase or decrease the tension as required. Holes are provided wherein the pin may be inserted at any quarter turn of the shaft.

A safety device on the firing mechanism proper prevents possible firing of the primer by lanyard until the breechlock is locked, whether the gun be in the loading or in the firing position.

SHOT TRUCKS.—Four shot trucks are furnished with each carriage for bringing projectiles to the gun. Each truck carries six projectiles. They are to be taken from the truck and inserted in the gun by hand. All shot-truck wheels are equipped with rubber tires, set in grooves on the wheels, and vulcanized in position.

SHOT TONGS.—Each battery is provided with one pair of shot tongs with each shot trolley installed, and a reserve of two pairs for the battery. In order to provide tongs having a small height over all and thus to increase the amount of possible hoist in the galleries of the emplacement, the tongs are designed with a lock which must be operated by hand before they will grip a projectile. This lock consists of a dog, the inner end of which presses against the top of the projectile while the outer side is held by a U-shaped piece rotated into position after the tongs have been placed on the projectile.

GREASE CUPS.—Ten grease cups are provided for lubricating the heavy bearings of the gun levers and the front and rear bearing surfaces of the vertical guides, with the heavy grease necessary for this purpose. The grease cup consists essentially of a body for carrying the grease and a cap carrying a piston actuated by a coiled spring. When the cap is screwed down over the body of the cup, the piston bears against the grease. By further movement of the cap the spring in rear of the piston is compressed, thus putting a sustained pressure on the grease. *This cap should habitually be kept screwed down so as to maintain a clearance of about 0.25 inch between its face and the face of the nut on the projecting piston, affording a visible indication that the grease is being forced into the bearing.*

IMPLEMENTS.—Each carriage is equipped with the wrenches, screw drivers, lifting hooks, pinch bars, and oil cans required for its mounting and care. These parts, except those too large, are stored in an armament chest, together with the necessary implements for the gun.

INSTRUCTIONS FOR ASSEMBLING THE CARRIAGE.

GENERAL REMARKS.—The carriage is dismounted for shipment, the heavy parts being separated, the finished surfaces slushed and covered with boards. The chassis and transoms are sometimes shipped assembled. The small parts are disassembled sufficiently for boxing them conveniently. Except where impracticable on account of the size or other characteristics, each part bears a piece mark shown on the drawing near the designation of the part. The first number of this piece mark indicates the drawing on which the part is detailed. Where it is possible to assemble the parts in more than one way, they are sometimes marked to indicate the way in which they were assembled during shop test—as, for instance, the two ends of two distance ring sections which adjoin are marked with the same number. The shipping list itemizes the contents of each box.

The following approximate weights are given as a guide in assembling and handling the parts:

Part.	Weight.
	<i>Pounds.</i>
Base ring, with traversing rack	8,000
Distance ring, four sections, without rollers	1,000
Racer	6,000
Chassis	6,000
Front transom	925
Rear transom	2,200
Guide frame, each	1,000
Piston-rod beam	750
Vertical guide, each	600
Guide bracket, each	550
Sight standard	1,050
Top carriage	2,600
One roller cage, with rollers	350
Bottom plate	3,300
Counterweight, largest piece	4,200
Recoil cylinder, with cylinder heads	970
Piston rod	350
Crosshead, with guide clips	3,200
Sighting platform	550
Elevating arm	650
Elevating band	320
Gun levers, axle, yoke, etc.	6,400
Counter-recoil buffer, assembled	350
Gears, shafts, brackets, cranks, and other parts not mentioned above, about	7,500
Total weight (unboxed), about	92,000

In assembling the carriage no part should be directly struck with a steel hammer or sledge. A wooden buffer should be used on the part to be struck, or soft-metal drifts or hammers should be used. In handling parts, care must be exercised that machined surfaces do not become burred. All bearing surfaces should be clean, smooth, and well lubricated prior to being brought together.

The assembling of the carriage requires the use of such blocking, way plank, hydraulic jacks, ropes, and pulleys as are usually found at seacoast forts. In addition to these a derrick or shears capable of safely lifting 4 or 5 tons will be found very useful.

INSTRUCTIONS FOR ASSEMBLING.—Carriages should be mounted under the immediate supervision of an ordnance machinist familiar with the work, so that the following instructions are intended to be general only.

BASE RING.—Move the base ring into position over the pit by means of the derrick or by skids and rollers, placing the part marked "Front" in the axis of the emplacement. Place a thrust plate on each holding-down bolt in such position as to receive the thrust from the leveling screws. Clean and oil the threads of the holding-down bolts, then lower the base ring, exercising great care not to burr these threads.

The base ring should be supported by the leveling screws so as to leave an opening underneath sufficiently wide for satisfactory grouting.

LEVELING.—The base ring should be carefully leveled by means of an accurate straightedge and a well-adjusted machinist's level. The straightedge should be used on the roller path by resting it on the inner edge with no blocks or other supports. The level should be reversed in every position and the mean position of the bubble taken as the correct one.

Preliminary leveling may be done from the azimuth circle by supporting one end of the straightedge on blocking in the center of the pit, but the final adjustment should be verified by readings taken on the roller path as described above. At the conclusion of the leveling, moderately tighten all holding-down bolts, verify the level, then add a grouting of neat Portland cement. Care must be exercised that this completely fills the entire space under the base ring. No weight should be added to the base ring until the grouting has thoroughly set. The leveling screws should then be backed off two turns.

DISTANCE RING AND TRAVERSING ROLLERS.—Carefully clean all parts, assemble the rollers in their bearings, with the distance ring in place, and run the system around by hand to see that all parts operate freely.

RACER.—Move the racer into position, clean the roller path and pintle surface, then carefully lower into position on the traversing rollers. Care should be exercised not to injuriously rub or cramp the pintle surfaces during the lowering. Assemble the outer and inner dust guards and the covers for openings in racer in order to prevent the possible entrance of dirt or metal chips. The racer should then be run around by hand to determine whether it be entirely free in its operation.

FRONT CLIPS may now be bolted in place.

CHASSIS AND GUIDE FRAMES.—Place either chassis in position, dowel, key, and bolt it to the racer. The rear of the racer may be identified by its being beveled for the rear transom. Lower its guide frame into position and bolt it to the underside of the chassis. Proceed similarly for the other chassis and its guide frame.

PISTON-ROD BEAM should then be attached to the lower ends of the guide frames.

VERTICAL GUIDES are then added. A series of circles about $\frac{1}{8}$ inch in diameter are located on the center of the right-hand guide about 2 feet apart, as measuring points for parallelism of guides.

THE FRONT AND REAR TRANSOMS are bolted in place.

BOTTOM PLATE.—Place blocking in the counterweight well to within 18 inches of the base ring, being careful to leave the center of the bottom plate uncovered as well as the holes for the four suspension rods. The bottom plate should be laid on this blocking, the clips on it engaging the vertical guides. It should be carefully leveled to prevent distortion of the bronze gibs.

RECOIL CYLINDER, with the lower cylinder head, should be placed on the bottom plate and secured to it.

COUNTERWEIGHT is then piled and the suspension rods inserted and secured to the bottom plate.

CROSSHEAD is then added from above. If the upper end of the recoil cylinder is found not to be exactly in position with respect to its bore in the crosshead the bottom plate should be tipped slightly as necessary by means of jacks applied to its underside.

RETRACTING AND TRIPPING GEAR.—The retracting and tripping gear are then assembled. After this is done the crosshead may be attached to the counterweight by means of the suspension rods. No attempt should be made to lift the counterweight with the retracting gear before the gun is in place.

PISTON ROD AND UPPER CYLINDER HEAD are then placed.

COUNTER-RECOIL BUFFERS AND ROLLER CAGES should now be added, the latter being so placed that the zero marks on rack teeth and recoil roller teeth coincide.

TOP CARRIAGE should be lowered into its forward position from above so that the gears will all engage properly.

GUN LEVERS are then added, the top carriage being run rearward for this purpose, and the lower ends secured to the crosshead by the gun-lever pins.

THE GUN WITH ELEVATING BAND attached is then put in place.

The remaining parts of the carriage may now be assembled as convenient, including the elevating arm, slide, etc.; guide brackets, sight standard, piston-rod brackets, elevating and traversing gearing, sight platform, sights, electrical equipment, recoil and buffer valves.

After the gun and elevating arm are in place, the gun may be retracted slightly, freeing the blocking under the counterweight, the blocking removed, and the carriage run slowly into battery by means of the retracting cranks. This will permit the attaching of those parts which require the gun to be in battery.

IMPORTANT POINTS.—After the carriage has been completely assembled and the gun mounted, the recoil and buffer cylinders filled, and the valves set as indicated in the description of the carriage, the following points should be noted, namely:

1. Traverse the carriage to the extreme position in both directions to see that it moves freely and that traversing stops are properly located.

2. Elevate and depress the gun to the extreme limits to see that the parts operate freely and that the depression stop is properly located.

3. Retract the gun while in its extreme positions against the azimuth stops to determine whether there be any interferences for recoil in such positions.

4. Examine and clean out all oil holes, noting that they have oil plugs.

5. See that there is not a hard bearing between the rimbases of the gun and gun levers.

6. See that the elevating arm and band are properly assembled, the clearances on each side being the same, and the arms not sprung or twisted.

7. See that the chassis rails and guide clips have not been burred.

8. See that the dust guard does not bear against the distance rings or racer.

9. Adjust the buffer valve until the gun rises as promptly as possible into battery without striking the stops with force.

10. See that the pawls engage simultaneously and that the retracting gearing, tripping gearing, and the safety latches function properly.

11. Set the elevation pointer by the use of a clinometer supported by a rest in the muzzle of the gun, dowel pin it in position, and verify the graduation.

12. Orient the gun, add numbers to the degree marks on the azimuth circle, adjust azimuth pointer to indicate correct azimuth, and dowel pin it in position. Muzzle at true south is 0 degrees in azimuth and numbers are placed around clockwise to include 359.

13. Adjust the sight-arm brackets so that the telescope will be parallel to the bore of the gun, as described previously in connection with the sight.

14. See that the electrical connections have been properly made, by trying the lights and firing the primer.

CARE OF CARRIAGE.

GENERAL INSTRUCTIONS.—Carriages should be traversed from time to time throughout their entire allowed movement. They should not be allowed to stand for long periods at a particular azimuth, as this might cause uneven settling of the platform.

The habitual position of guns on disappearing carriages is "from battery," but at intervals the gun should be allowed to rise to the firing position and be elevated and depressed within the limits of the stops.

It is required that all parts of carriages be kept free from rust at all times. If this be allowed to accumulate, its removal from bearing parts, and especially piston rods, requires particular attention, in order that clearances may not be unduly increased. The use of sandpaper for this purpose is forbidden, and emery cloth No. 1 should be used, the rust being softened, if necessary, by kerosene.

The retracing wire ropes should at all times be kept well oiled with raw linseed oil.

If any leakage occurs from the hydraulic recoil system, it should be immediately remedied, calling if necessary upon the district armament officer for the services of skilled labor.

The repacking of stuffing boxes may be done, when necessary, by trained enlisted men under the supervision of an officer, but will preferably be done by skilled labor.

Before removing a cylinder head containing a stuffing box, or drawing a piston rod through a stuffing box, the pressure of the packing on the rod should be released by unscrewing the follower or gland several turns.

The copper gaskets between cylinders and their heads should be in good condition, and consequently should be replaced whenever necessary in order to prevent leakage.

CLEANING HYDRAULIC CYLINDERS.—Recoil and buffer cylinders should be emptied and refilled at least every three months, and thoroughly cleaned every six months. For cleaning, a plumber's hand force pump is supplied to each Coast Artillery post, with about 10 feet of suction hose and 15 feet of discharge tube.

The following operations are outlined for cleaning the recoil cylinder:

(a) Retract the gun sufficiently to afford room for working below the recoil cylinder, remove the oil from the cylinder and the glands and followers.

(b) Remove the piston-rod bracket, locking disk, and the upper cylinder head. Remove the lower piston-rod nut, screw the upper nut downward, raising the rod until the nut is removed. Allow the rod to rest on a block over its hole in the piston-rod beam.

(c) Run the gun slowly into battery by means of the retracting cranks, raising the ratchet pawls, and give the gun its maximum elevation. Raise the piston rod vertically until its upper end strikes the gun, then incline it to one side and remove it from the cylinder.

(d) Thoroughly clean the cylinder from its upper end with kerosene oil forced in with the hand pump, then wipe dry with clean cotton waste. Clean also the cylinder heads, glands, and followers; and the piston rod inside and out, removing the recoil valve.

(e) After the removal or evaporation of all kerosene oil, reassemble the parts and refill the cylinder with hydrolene oil, carefully inspect all parts which were dismantled, and complete the retraction of the gun.

The following operations may be outlined for cleaning the buffer cylinders:

(a) Remove the glands, stuffing boxes, and pistons; and also the gland, valve stem, and emptying plug of the buffer valve.

(b) Clean the cylinders as described for the recoil cylinder. The equalizing and throttling pipes should also be thoroughly cleaned by forcing the oil into them with the pump, permitting it to run out through the emptying hole.

(c) After the removal or evaporation of all kerosene oil, reassemble the parts and refill the cylinders with hydrolene oil, after which close the buffer valve to its normal setting.

REMOVING PACKING FROM STUFFING BOXES.—A packing extractor for removing packing from the stuffing boxes of the recoil cylinder is issued to each post at which these carriages are mounted. To use the extractor, the gun must be retracted sufficiently to afford access to the stuffing boxes. Close the extractor around the piston rod and insert the locking pin, turn the extractor counter-clock wise, pressing it against the packing until the needles are firmly engaged. Draw the packing out, turning slowly counter-clock wise. Extractor bars are provided for use in starting the packing from its seat by inserting the toes of the bars in the rack teeth and prying over the edge of the box, being careful not to injure it.

The packing of the buffer cylinders and of the buffer valve can generally be removed with any pointed instrument by merely removing the glands. In case of difficulty, the stuffing boxes of the former can be removed and the packing taken out with the finger; and in the latter, the valve stem may be removed.

REPACKING STUFFING BOXES.—Examine the old packing and discard all unfit for use. If any of the old packing is used, it should be put in after the new.

To repack a stuffing box after the packing has been removed, insert one ring of packing and force it well to the bottom of the box by a wooden stick and mallet. Treat each layer of packing in a similar manner, being careful that successive rings break joints. Six rings of packing are required for each stuffing box of the recoil cylinder, five rings for each stuffing box of the buffer cylinders, and four rings for the buffer valve.

In screwing up the glands or followers, *no other tools should be used than those provided for the purpose, nor should excessive force be applied to them, such as the addition of a pipe to the handle of the wrench.* Care should be exercised in tightening the glands to advance all of the bolts evenly so as not to throw the gland out of alignment. It will be found necessary to tighten the glands of the buffer cylinders but slightly. *Attention is invited to the caution given in regard to this under the description of the counter-recoil buffers.*

It is to be expected that a slight amount of oil will soak through and drip from boxes of carriages when not in use. Also when tightening the followers a slight amount of oil will squeeze out of the saturated packing. This oil should be caught and not allowed to render the carriage unsightly.

FILLING CYLINDERS.—To fill the recoil cylinder, remove the filling plug and pour clean hydrolene oil into it through a funnel until the oil overflows. *Allow any air that may be present to escape, then pour in more oil until the cylinder is again filled.* About 7.5 gallons are required. The cylinder should be filled with the gun slightly out of the recoiled position.

To fill the buffer cylinders, remove both filling plugs and pour clean hydrolene oil through a funnel into one cylinder, allowing the air to escape from the other, until both cylinders are filled. *Allow any air that may be present to escape and pour in more oil until the system is again filled.* A full gallon of oil is required.

SERVICE CONDITION (LUBRICATION, ETC.).—When the carriage is to be kept in readiness for service, and is in daily or frequent use, all bearing parts must be kept thoroughly cleaned and lubricated. Especial attention should be given to the lubricating of trunnion beds, rollers, pintle surfaces, shaft bearings, and sliding surfaces; gun-lever axle beds, gun-lever pins, elevating screw, elevating band trunnions, crosshead guides, and the elevating, traversing, tripping, and retracting mechanisms, including the teeth of all gears.

The above parts should be lubricated at frequent intervals, whether the carriage is maneuvered or not. When carriages are in use for

daily drills a thorough lubrication twice each week should be sufficient for all but the most severely used parts.

Proper lubricating and cleaning of the traversing rollers and their paths are essential to free working of the carriage. The dust guards should be removed to clean the upper roller paths. By removing the cover plates on the racer the traversing rollers may be lifted out with their bearings for cleaning and for cleaning the lower roller path.

Four oil plugs are screwed into steel tubes in the upper surface of the racer, outside of the front and rear of each chassis, which are provided with passages to the pintle surface. Eight oil plugs, two at each of the above points, are also provided, connected to brass tubes reaching down to the oil grooves of the distance ring, thus providing lubrication for the bearings of the rollers. Six additional of such oil pipes are also provided, two each at the front, right, and left of the racer for exceptional use in lubricating the roller bearings. They are closed by countersunk screws. *For oiling the rollers or pintle through these holes the carriage must be traversed in order to distribute the oil through the entire circumference.*

It will occasionally be necessary to examine all ball and roller bearings to see that the dust guards are in proper place and that the rollers themselves are clean. If they be found dirty, they may be flushed with kerosene oil; but care must be taken to fill the bearings with synovial oil after the kerosene has drained away. If the rollers have rusted, they must be well removed and cleaned.

CONDITION "IN ORDINARY" (NOT READY FOR IMMEDIATE SERVICE).—If the carriage is to remain unused for a time, all unpainted surfaces should be covered with a *thin* coat of light slushing oil. It can be applied as in painting, using sash tool No. 6, except in cold weather, when it should be applied by stippling, i. e., light tapping, with the brush held perpendicular to the surface to be covered.

In all cases it should be applied in a thin coat, as this is all that is needed to give good protection.

This oil is easily removed by the use of burlap or waste dipped in kerosene oil. In order to save oil, the thickest of the slushing oil should be well removed by a scraper before applying the kerosene.

Before applying the slushing oil, the surfaces should be thoroughly cleaned, so as to be entirely free from rust, water, kerosene, or lubricating oil, as the first three would cause rusting underneath, and the latter would cause it to run off when heated.

Rollers and roller paths should be cleaned and slushed from time to time and the dust guards examined to see that the felt strips are in order and make the openings dust tight.

Experience has shown that hydraulic cylinders should not remain empty, as in that case the interior walls soon become rusty.

OIL HOLES.—Oil holes should be cleaned out frequently to keep them free from sand and grit, and should habitually be kept closed by the screw plugs provided, except when in the act of oiling.

Before removing the plug from any oil hole carefully wipe off any dirt or grit near the opening that might be carried into the bearing with the oil.

COMPRESSION GREASE CUPS.—Where compression grease cups are provided similar precautions against dirt and grit must be observed. When adding grease to these cups do not fill them completely, but fill only to the bevel at the top of the cup; if too full, the leather packing will become inverted and will not act effectively. In putting on the cap see that the leather packing enters the cup without being caught or bent by the edge of the cup.

Screw the cap down on the cup until the spring rod projects about 0.25 inch above the top of the cap. The cap should be screwed down from day to day as required to maintain about this projection for the rod. When the cap is screwed nearly home the cup should be refilled.

OILS AND GREASE.—The Vacuum Oil Co.'s No. 4½ lubricant is issued for use in the compression grease cups; it will not be used for lubricating any other parts, nor will any other oil be used in its place.

Light slushing oil is provided for covering unpainted surfaces on the gun and carriage, as well as the bore of the gun, when they are not in current use.

Engine oil should be used to lubricate the bearings where oil holes and oil plugs are provided. It will also be used as a lubricant for breechblock threads. No other lubricant will be used on such threads during firings.

Kerosene oil is issued by the Ordnance Department for cleaning purposes only.

A special grade of neutral oil called "hydroline," having a specific gravity of about 0.85, is furnished for filling the recoil cylinders. A barrel of this oil should be kept on hand to replace leakage.

The different kinds of oil, etc., will be kept in receptacles plainly marked with their contents. The enlisted men should be carefully instructed in the use of the several kinds of oil, grease, etc., and should be taught to distinguish one from another.

Oils must always be kept in closed receptacles to prevent contamination by water, dirt, etc.

Oils which have been used for any purpose should not be used again without being filtered or carefully strained. They should never be returned to receptacles containing new oils.

A suitable receptacle should be kept by each battery in which oil from cylinders can be placed and allowed to stand undisturbed until all sediment in it has settled. In removing the oil great care should be taken that no sediment is included.

Mere discoloration does not affect the serviceability of the oil.

PAINTING.—In general, three coats of paint will be given carriages the first year; two coats annually thereafter will probably suffice, the actual needs depending somewhat upon the climate and local conditions. Before painting, surfaces should be rubbed smooth and made perfectly clean and dry. As soon as the carriage is completely assembled and the piece mounted, all parts which have been marred in transportation will be primed, after which one complete coat of olive paint will be applied.

All steel and iron nonbearing surfaces, both covered and exposed, will be painted. This includes the exposed parts of shafts (except squared ends), the exterior of the recoil cylinder, and springs. Large bronze pieces, including the web and spokes of wheels, and cylinder heads should also be painted.

The following parts are not painted: All wearing or bearing surfaces, including the handles of handwheels and cranks, teeth of all gears, the rollers and the surfaces on which they travel, the piston rods, and the vertical guides, etc.

List of implements furnished for 6-inch gun, models of 1905 and 1908.

- 1 rammer head and staff.
- 1 sponge head and staff in three sections; head to be made to fit bore or chamber by wrapping with burlap.
- 1 breech cover.
- 1 combined tompon and muzzle cover.
- 1 slush brush to connect with sponge staff.
- 1 wire cleaning brush and coupling to fit sponge staff.

For allowances of cleaning and preserving material, see Form No. 1869.

List of articles packed in the armament chest for 6-inch guns, models of 1905 and 1908, on 6-inch disappearing carriages, models of 1905, 1905 M1, and 1905 M11.

[NOTE.—All articles marked * are carried loose in chest.]

For guns, model of 1905–1908:

- 1 box for firing mechanism.¹
- 3 brushes, cleaning, for primer seat.
- 1 cloth, emery, No. 00, 1 quire.
- 1 drift, bronze, large.
- 1 drift, bronze, small.
- 1 drill, gunner's.
- 3 files, pillar, No. 6, 6-inch.²
- 3 files, three-cornered, No. 4, 6-inch.²
- 3 files, half-round, smooth, 8-inch.²
- 3 files, round, smooth, 8-inch.²
- 1 file, flat, dead smooth, 8-inch.
- 1 file, round, second-cut, 8-inch.

¹ For use only with 6-inch wire-wrapped gun, model of 1908.

² For use on bruised breechblocks. No other files to be used thereon.

For guns, model of 1905-1908—Continued.

- 1 file, half-round, smooth, 8-inch.
- 1 file, three-cornered, 8-inch.
- 1 hammer, boilermaker's.
- 1 hammer, copper.
- *1 lanyard, gunner's.
- 1 mallet, hand.
- 1 mallet, long handle.
- 1 pliers, cutting, 7-inch.
- *1 pouch, gunner's.
- 1 punch, gunner's.
- 1 punch, pin.
- 1 reamer, cleaning, for primer seat.
- 1 scraper, metal.
- *1 pair sleeves, gunner's.
- *3 sponges, wagon.
- *4 balls twine, assorted.
- *10 pounds cotton waste.
- *2 pounds wire, copper No. 12.
- *2 pounds wire, copper No. 16.
- 1 wrench, monkey, 12-inch.
- 1 wrench, monkey, 15-inch.
- 1 wrench, tit, for obturator.
- *1 screw driver, bar, for spindle key, gear segment screws, etc.¹

Implements for carriage:

- 1 extractor, gun-lever pins.
- 2 hooks, counterweight.
- 2 hooks, traveling roller.
- 2 oilers, half-pint.
- *1 oiler, locomotive—1 quart.
- 2 pinch bars.
- 1 screw driver, commercial, 3-inch blade.
- 1 screw driver, commercial, 5-inch blade.
- *1 screw driver and socket wrench.²
- 1 wrench, double, 0.375 and 0.5 inch nuts.
- 1 wrench, double, 0.625 and 0.75 inch nuts.
- 1 wrench, double, 1 and 1.25 inch nuts.³
- 1 wrench, double, 1.5 and 1.75 inch nuts.
- 1 wrench, double, 2.5 and 2.75 inch nuts.
- 1 wrench, single, 3-inch nuts.
- 1 wrench, single, 0.75-inch nuts.
- 1 wrench, throttling valve, and nut.
- *1 wrench, buffer gland (for model of 1905 only).
- *1 wrench, single, piston rod.
- *1 wrench, spanner, for recoil and buffer followers (models of 1905-Mr and 1905-Mr).
- 1 extractor, piston rod and valve stem.
- 2 extractors, cylinder, cylinder head and retraction clutch shaft.
- 1 extractor yoke, cylinder and cylinder head.
- *1 wrench, "throttling bar bolts." (Model of 1905-Mr only.)

¹ For lanyard attachment.

² To be used for latch-plate screws on gun.

³ Wrench to be used on drain plug for models of 1905-Mr and 1905-Mr.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905-M11, their piece marks, location, and material of which they are made.

The parts are listed alphabetically under the following headings: Carriage proper; counter-recoil system; azimuth pointer; the electrical equipment; shot trucks; shot tongs; and grease cup.

When referring to a part, always mention its piece mark, where given on the list.

Meaning of the abbreviations in the column of material.

A	Ash.	S	Steel.
Br	Brass.	SB	Sheet brass.
Bz	Bronze.	SS	Sheet steel.
C	Copper.	SpS	Spring steel.
CI	Cast iron.	VF	Vulcanized fiber.
CS	Cast steel.	VR	Vulcanized rubber.
F	Felt.	WI	Wrought iron.
FS	Forged steel.	GWHP	Garlock waterproof
GI	Galvanized iron.		hydraulic pack-
GS	German silver.		ing.
HR	Hard rubber.	FVF	Flexible vulcanized
SR	Soft rubber.		fiber.
MgI	Magnet iron.	PHBZ	Phosphor bronze.
MI	Malleable iron.	GP	Garlock packing.
Comm	Commercial.	R	Rubber.
MM	Molded mica.		

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 M11.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks.
7A1	2	Angles	On guide clips	S	
	1	Angle (front)	Right sighting platform	S	3 by 3.5 by 0.3125.
	1	Angle (inside)	do	S	Do.
	1	do	Left sighting platform	S	Do.
	1	Angle (rear)	Right sighting platform	S	Do.
	1	do	Left sighting platform	S	Do.
	1	Angle (outside)	do	S	Do.
	1	do	Right sighting platform	S	Do.
H6M	1	Axle cap (left)	On top carriage	CS No. 2	
H6L	1	Axle cap (right)	do	CS No. 2	
H23K	1	Ball thrust bearing	Traversing gear	S	
H23L	1	do	do	S	
H16H	2	Band trunnions	Elevating band (H16J1)	FS No. 2	
H16P	2	do	Elevating band (H16Q1)	FS No. 2	
H3D2	1	Base ring	On concrete platform	CI No. 2	
H4C1	48	Bearings	On traversing rollers	Bz No. 3	
9FA	1	Body	Interior of piston rod (9BA)	Bz No. 4	
H4L	4	Bolts, special with nuts	Outer dust guard	S	0.5 by 1.375.
6N	2	do	In front transom	S	1.25 by 9.625.
6Q	2	do	do	S	1.25 by 12.875.
H6J	8	Bolts, special	In axle caps (H6L) (H6M)	S	
8R	4	do	In cap squares (8K) (8L)	S	1.5 by 6.5.
9D	6	Bolts, special tap	In lower cylinder head through counterweight.	S	1.125 by 5.
19M1	2	Bolts, special with nuts	In sight standard	S	1.5 by 10.0625.
19N	1	Bolt, special with nut	do	S	2 by 8.375.
H3C	6	Bolts, tap	In traversing stops	S	
H4K	96	do	In bearings (H4C1)	S	0.5 by 1.375.
H4M	104	do	Inner and outer dust guard	S	0.375 by 0.75.
H4N	24	do	Outer dust guard	S	0.5 by 0.75.
4H	14	do	In right chassis	S	1.25 by 3.
5D	14	do	In left chassis	S	Do.
H15E	2	do	In piston-rod bracket	S	0.75 by 2.
H15F1	24	do	In guides	S	1 by 6.75.
6A	4	do	In elevating screw support	S	0.75 by 1.5.
6D	8	do	In front clips and rear transom.	S	1.25 by 3.
6T	2	do	In rear transom	S	1.25 by 6.25.
6U	18	do	In elevating gibs	S	1 by 2.5.
6X	3	do	In front transom	S	1.25 by 3.25.
7B	8	do	In angles (7A1)	S	0.75 by 1.25.
7B	8	do	In bottom plate gibs	S	Do.
7B	8	do	In guide clips	S	Do.
7T	4	do	In keys (7M)	S	1 by 1.75.
8N	4	do	In gun lever yoke	S	1.5 by 3.
9A	8	do	In cylinder head (9Q)	S	1 by 2.5.
9J	18	do	In recoil cylinder (9G)	S	0.75 special.
9S	2	do	In oil gutter (9U)	S	0.375 by 0.75.
10E	4	do	In recoil pointers	S	0.75 by 2.
H12P	2	do	In rope clamps (H12F) (H12G)	S	0.5 by 1.5.
H13B	2	do	Rear clip and traversing bracket.	S	1.25 by 3.
11R	2	do	In pointer base (11Q1)	S	
13F	4	do	In trough brackets	S	
16A	4	do	In upper traversing bearing	S	0.75 by 1.75.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 M11, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 M11—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
16Q	2	Bolts, tap	In lower traversing bearing..	S	0.75 by 2.5.
17AA	6	do	In shoulder brackets	S	0.375 by 1.125.
18V	2	do	In tripping lever stop	S	0.75 by 1.25.
19A	4	do	In sight arm bracket (19D)	S	0.75 by 2.125.
19G	8	do	In guide brackets	S	1 by 3.5.
19J	11	do	In racer plates	S	0.5 by 1.
9V	8	do	In guide brackets	S	1 by 14.125.
20D	4	do	In sighting platform frame	S	0.75 by 1.25.
25B	3	do	In spring retainer bracket	S	0.375 by 1.125.
25C	1	do	do	S	0.5 by 1.25.
25E	2	do	In spiral spring retainer (25D)	S	0.5 by 2.25.
26C	8	do	In retracting drums	S	
7J	1	Bottom plate	Under counterweight	CS No. 1	
7K	2	Bottom plate gibs	On bottom plate (7J)	Bz No. 4	With oil grooves.
7L	2	do	do	Bz No. 4	Without oil grooves.
7V1	2	Bottom plate liners	do	Bz No. 4	
H4P	16	Bolts, with nuts	Distance ring	S	0.875 by 3.625.
H4Q	8	do	do	S	0.875 by 2.625.
H15B	16	do	In chassis	S	1.25 by 5.375.
H15P	2	do	In piston rod bracket	S	0.75 by 3.875.
H15M	8	do	In piston rod beam	S	1.25 by 4.875.
6M	18	do	In rear transom	S	1.25 by 7.625.
6P1	2	do	In front transom	S	1.25 by 11.125.
6S	4	do	In rear transom	S	1.25 by 9.875.
6W	10	do	In front transom	S	1.25 by 7.875.
8J	8	do	In gun levers	S	1.5 by 6.375.
H16M	2	do	Elevating band (H16Q1)	S	1.75 by 11.75.
H16N	2	do	Elevating band (H16J1)	S	1.75 by 13.875.
H13F	4	do	Rear clip and traversing bracket.	S	1.25 by 4.125.
13E	4	Bolts, with nuts, counter-sunk.	In rope trough	S	0.75 by 1.375.
13G	2	do	do	S	
13V	4	Bolts, with nuts	Retracting shipper	S	
13Z	12	do	Retracting crank shaft bracket.	S	0.75 by 3.8125.
H18R	2	do	In elevating gear cover	S	0.5 by 1.375.
H18S	2	do	do	S	0.5 by 4.125.
16C	4	do	Traversing hand wheel shaft gear cover.	S	0.5 by 3.
16E	1	do	Traversing clutch gear cover	S	0.5 by 1.5.
16F	1	do	do	S	0.5 by 2.
16G	1	do	do	S	0.5 by 6.625.
16N	4	do	Traversing crank shaft gear cover.	S	0.5 by 2.125.
16R	4	do	In lower traversing bearing	S	0.75 by 3.75.
17T	1	Bolt, with crown nut	In shoulder brackets	S	0.75 by 7.125.
17W	2	Bolts, with nuts	In firing pistol bracket	S	0.625 by 2.125.
19K	4	do	In guide brackets	S	1.5 by 13.75.
19R	2	do	do	S	1.5 by 10.5.
19W	4	do	do	S	1 by 10.
19X	4	do	In sight standard (19L1)	S	0.75 by 3.
20G	6	do	Subcaliber platform	S	0.625 by 1.625.
20P	21	do	In post feet (20N)	S	0.625 by 1.875.
20Q	1	do	do	S	0.625 by 2.25.
20V	4	do	In ladder sides (20W) (20X)	S	0.75 by 1.625.
20DA	8	do	In sighting platform floor	S	0.625 by 2.25.
20FA	4	do	In ladder brace (20EA)	S	0.75 by 1.875.
20GA	2	do	do	S	0.75 by 2.125.
20HA	7	do	In platform brackets	S	1.25 by 10.75.
20JA	1	do	do	S	1.25 by 10.25.
20MA	2	do	In sighting platform	S	0.5 by 1.375.
20A	2	Braces, corner	Sighting platform	S	
20BA	1	do	do	S	On right side.
20L	2	Brace feet	Subcaliber platform	FS	
20M	2	Brace pins	In brace feet (20L)	FS	
18HA	2	Bushings	In tripping lever latches	Bz	
18EA1	2	do	In locking levers (18CA2)	Bz	
18J	4	do	In pawls (18K1)	Bz	
18H	4	do	In pawl levers (18R2) (18Q2)	Bz	
16V	1	do	In upper traversing bearing	Bz	1.25 inside diameter.
16M	1	do	In lower traversing bearing	Bz	
16J	1	do	In upper traversing bearing	Bz	
16B	1	do	Upper traversing bearing	Bz	1 inside diameter.
N18N	1	do	In traversing clutch gear	Bz No. 2	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 Mm, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 Mm—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
13R	2	Bushings.....	In rope sheaves.....	S	
12AA	2	do.....	In clutch sleeve.....	Bz	
	1	do.....	Elevation disk gear.....	Bz	
H13H	2	do.....	In upper guide sheave.....	Bz	
H13G	2	do.....	In lower guide sheaves.....	Bz	
H16G	2	do.....	Elevating arm.....	Bz	
9GA	1	do.....	In lower cylinder head (9V).....	BZ No. 4	
H12E	2	do.....	In elevating slide.....	Bz	
9P	1	do.....	In upper cylinder head (9Q).....	BZ No. 4	
8G	2	do.....	In upper end of gun levers.....	BZ No. 3	In halves.
8A	2	do.....	In lower end of gun lever.....	BZ No. 3	
H6C	36	do.....	In rollers (H6F).....	Bz	
H6B	36	do.....	In rollers (H6D).....	Bz	
6L	1	do.....	In transom cap (6K).....	BZ No. 2	
6C	1	do.....	In elevating screw support.....	Bz	
5A	1	do.....	In left chassis.....	Bz	
4G	1	do.....	In right chassis.....	Bz	
4F	1	do.....	do.....	Bz	
H6S	1	Bushing, axle bed.....	In top carriage.....	BZ No. 3	Right, in halves.
H6T	1	do.....	do.....	BZ No. 3	Left in halves.
H6W1	2	Buffer rod cups.....	On front of top carriage.....	FS No. 3	
8K	1	Cap square.....	On upper end of gun lever.....	CS No. 2	Right.
8L	1	do.....	do.....	CS No. 2	Left.
5C3	1	Chassis, left.....	On racer.....	CI No. 2	
4A	1	Chassis, right.....	do.....	CI No. 2	
H4E	4	Clamps.....	Outer dust guard.....	S	Hold section together.
11BA	1	Clamping screw.....	In pointer base.....	S	
	2	Clevises.....	For rope of counterbalance device.....	FS	Attaching rope to equalizing bar (H13N).
7R	10	Clip bolts, with special nuts.....	In guide clips.....	FS	Long.
7S	6	do.....	do.....	FS	Short.
17N	1	Clutch fork.....	On pin (16L).....	S	Attached to clutch rod.
17L	1	Clutch rod.....	Attached to lever (17J).....	FS	
17M	1	Clutch rod end.....	On clutch rod (17L).....	FS	
12Z1	1	Clutch sleeve.....	Retracting drum shaft.....	S	
H13L	2	Collars.....	Lower guide sheave axle.....	S	
11E	1	do.....	On intermediate stud (11F).....	S	
11H	1	do.....	On stud (11G).....	S	
11N	4	do.....	On elevating shaft.....	Bz	
11U	1	do.....	do.....	Bz	
11DA	1	do.....	On correction screw.....	S	
12L	1	do.....	Retracting intermediate shaft.....	Bz	
12M	1	do.....	Retracting drum shaft.....	S	
12W	1	do.....	do.....	S	
12X	1	do.....	do.....	Bz	
12CA	1	do.....	Retracting crank shaft.....	Bz	
12DA	2	do.....	do.....	Bz	
13B	2	do.....	On rope sheave pins.....	S	
13RA	1	do.....	On retracting brake lever stud.....	S	
14A	1	do.....	On traversing crank shaft.....	S	
14C	5	do.....	do.....	Bz	Provided with felt washers.
14M	1	do.....	On traversing intermediate shaft.....	Bz	
16P	1	do.....	On pin (16L).....	S	
18Z	1	do.....	On shaft (18X).....	Bz	
12J	1	Collar, inner.....	Retracting intermediate shaft.....	Bz	
12K	2	Collars, outer.....	do.....	Bz	
7D	2	Counterweight pieces of eighth layer.....	Counterweight.....	CI	
7E	2	Counterweight pieces, side, of seventh layer.....	do.....	CI	
7F	1	Counterweight inside piece of seventh layer.....	do.....	CI	
7G	1	Counterweight special layer.....	do.....	CI	Used with model 1908 gun.
7H	6	Counterweights, first to sixth layers, inclusive.....	do.....	CI	
11L2	1	Correction screw.....	In pointer base.....	S	
12GA	2	Crank hooks.....	In chassis.....	FS	For cranks when not in use.
12HA	2	Crank handle hooks.....	do.....	FS	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
20T	2	Crosses.	Sighting-platform railing	MI	
7C	1	Crosshead	Above counterweight	CS No. 1	
7V	2	Crosshead gibs	In guide clips rear surface, interior.	BZ No. 4	0.735 thick.
7AA1	2	do.	In guide clips front surface, interior.	BZ No. 4	0.485 thick.
7Q	2	Crosshead liners	In guide clips	BZ No. 4	
	2	Crown nuts	On sight arm bracket pins (19C).	S	
	1	do.	On retracting brake lever stud.	S	
14F	2	do.	On traversing handwheel shaft.	S	
14L	1	do.	On traversing intermediate shaft.	S	
14P	1	do.	do.	S	
14T	2	do.	On traversing pinion shaft.	S	
11S	1	do.	On elevating shaft.	S	
	8	do.	On suspension rods (7U)	S	
6V	2	do.	On studs (6H)	S	
9V	1	Cylinder head, lower	Lower end of recoil cylinder (9G).	FS No. 3	
9Q	1	Cylinder head, upper	Upper end of recoil cylinder (9G).	S	
H4A2	1	Distance ring	Between racer and base ring	CS	In 4 sections.
H23W	2	Direction plates	On elevating handwheel	Bz	Depress.
H23Z	2	do.	do.	Bz	Elevate.
H23BA	2	Direction plates, filling plug	On buffer cylinders	Bz	Curved for surface of cylinder.
H23CA	1	do.	On crosshead	Bz	
H23S	1	Direction plate, retracting	Retracting crank shaft bracket.	Bz	Right.
H23T	1	do.	do.	Bz	Left.
H23V	1	Direction plate, traversing	On right chassis	Bz	
9T1	1	Drain plug	In lower cylinder head (9V)	FS No. 3	
16U	1	do.	In traversing crank shaft gear cover	Bz	
H4D	1	Dust guard, outer	Attached to base ring outside roller path.	S	In 4 sections.
H16F	1	Elevating arm	Between elevating slide and band.	CS No. 2	
H16J1	1	Elevating band	On gun	CS No. 1	For gun model 1905.
H16Q1	1	do.	do.	CS No. 1	For gun model 1908.
11A2	1	Elevation disk gear	On stud (11G)	CI	
11D3	1	Elevation disk	On elevation disk gear	GS	Range scale.
H18T	1	Elevating-gear cover	Over elevating-shaft gears	CI	Upper half.
H18X	1	do.	do.	CI	Lower half.
6F	1	Elevating gib, right	In rear transom	S	
6G	1	Elevating gib, left	do.	S	
11Z	1	Elevating, handwheel, commercial.	On elevating shaft	CI and WI	Spokes cast in hub.
H16E	1	Elevating pin	Elevating arm	FS No. 3	
H12A	1	Elevating screw	In rear transom	FS No. 3	
6B	1	Elevating-screw support	Bottom of rear transom	CS	
11Y	1	Elevating shaft	In left chassis	FS	
H18E	1	Elevating-shaft gear	On elevating screw	CI No. 1	
H18F	1	Elevating-shaft pinion	On elevating shaft	FS No. 2	
H12D1	1	Elevating slide	In rear transom	CS No. 2	
H12H	1	Elevating-slide nut	In elevating slide	BZ No. 4	
H12J	1	Elevating-slide spring	On elevating-slide nut	S	
H12N1	1	Elevating-slide stop	On rear transom	FS	
20R	7	Elbows	Platform railings	MI	
H13N	1	Equalizing bar	On equalizing-bar fork	S	
H13D1	1	Equalizing-bar fork	In weight (H13E)	FS	
H13P	1	Equalizing-bar pin	In equalizing bar	FS	
H13A	2	Eyebolts	In weight (H13E)	S	
8M	2	do.	In cap squares (8L) (8K)	S	
H6Q	2	do.	In axle caps (H6L) (H6M)	S	
	4	Filler pieces	Subcaliber platform	S	0.1875 thick.
	2	do.	Sighting platform	S	0.3125 thick.
9F	2	Filling plugs	In upper cylinder head (9Q)	Bz	1 extra.
17X	1	Firing pistol bracket	On upper traversing bearing	Bz	
H4H	4	Fish plates	Outer dust guard (H4D)	S	
17D	1	Foot piece	On shank (17E)	Bz	
6E	2	Front clips	On racer over lips of base ring.	CS No. 2	Part of clutch plunger.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 M11, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 M11—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
17B	1	Fulcrum.....	Underneath left sighting platform.	Bz	
20K	2	Fulcrum pins.....	In platform fulcrums (20H) (20J).	FS	Riveted in.
	2	Gaskets.....	Under upper cylinder head (9Q).	C	
	18	do.....	On bolts (9J).	C	
	1	Gasket.....	On lower cylinder head (9V).	C	
H6A1	36	Gears.....	On rollers (H6D).	FS No. 3	
9M	1	Gland.....	In upper cylinder head (9Q).	BZ No. 4	
9N	1	do.....	In lower cylinder head (9V).	BZ No. 4	
19T	1	Guide bracket, left.....	On left chassis.	CS No. 2	
19S	1	Guide bracket, right.....	On right chassis.	CS No. 2	
7P1	1	Guide clip, left.....	On crosshead.	FS No. 3	
7N1	1	Guide clip, right.....	do.	FS No. 3	
H15N2	1	Guide frame.....	Under chassis.	CI No. 2	Right.
H15L2	1	do.....	do.	CI No. 2	Left.
H13K	2	Guide sheaves, lower.....	Rear clip and traversing bracket.	CI No. 1	
H13J	2	Guide sheaves, upper.....	Rear transom.	CI No. 1	
H13S	1	Guide sheave axle, lower.....	Rear clip and traversing bracket.	FS	
H13T	1	Guide sheave axle, upper.....	Rear transom.	FS	
H15H1	1	Guide, vertical.....	On chassis and guide frame.	FS No. 2	Right.
H15J1	1	do.....	do.	FS No. 2	Left.
8H	1	Gun lever axle.....	On top carriage.	CS No. 3	
8Q	1	Gun lever, left.....	On gun lever axle.	CS No. 2	
8P	1	Gun lever, right.....	do.	CS No. 2	
7Z	2	Gun lever pins.....	In crosshead.	FS No. 2	
8T	1	Gun lever yoke.....	Between gun levers.	CS No. 2	
9DA	1	Hasp.....	On hasp bracket (9Y).	S	
9Y	1	Hasp bracket.....	On piston rod bracket.	Bz	
13EA	2	Idler sheaves.....	In rope sheave brackets.	CI	
13C	2	Idler sheave pins.....	do.	FS	
11B1	1	Intermediate gear.....	On stud (11F).	CI	
11C	1	Intermediate pinion.....	do.	Bz	
11F	1	Intermediate stud.....	In left chassis.	S	
	2	Keys.....	In right chassis.	S	
	2	do.....	In left chassis.	S	
H15Q	2	do.....	In chassis and guide frame.	FS No. 3	
7M	2	do.....	On crosshead (7C).	FS No. 2	
	1	do.....	Elevating screw.	S	
	3	do.....	Elevating shaft.	S	
	1	do.....	Retracting intermediate shaft.	S	0.5 square, staked in.
	2	do.....	Retracting drum shaft.	FS No. 3	Riveted in.
	2	do.....	do.	S	0.5 square, staked in.
	2	do.....	In rope sheave pins (13A).	S	Staked in.
	2	do.....	In traversing shaft pinion.	S	
14V	1	do.....	In traversing crank shaft.	S	
	2	do.....	do.	S	Riveted in.
	1	do.....	In traversing handwheel shaft.	S	0.5 square.
	2	do.....	In traversing intermediate shaft.	S	
18Y	2	do.....	In shaft (18X).	S	
	1	do.....	do.	S	Staked in.
12H	1	Key, square gib.....	Retracting intermediate shaft.	S	
12P	2	do.....	Retracting drum shaft.	FS No. 3	8.5 long.
12Q	1	do.....	do.	FS No. 3	3.625 long.
12T	1	do.....	Retracting crank shaft.	S	
12V	1	do.....	do.	S	
20EA	2	Ladder braces.....	For ladder sides (20W) (20X).	S	
20X	2	Ladder sides, left.....	Sighting platform.	S	
20W	2	Ladder sides, right.....	do.	S	
20U	8	Ladder steps.....	Between ladder sides (20W) (20X).	S	
17G1	1	Latch.....	In spring stirrup (17F).	S	
17BA	1	Latch pedal.....	On latch (17G1).	S	For operating latch.
18LA	2	Latch springs.....	In spring bracket (18MA) (18NA).	SpS	
18W	1	Lever.....	On shaft (18X).	FS	For tripping.
17J	1	do.....	In fulcrum (17N).	S	
H3E	12	Leveling screws.....	In base ring.	S	
9L	1	Liner.....	In lower cylinder head (9V).	BZ No. 4	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
9W	4	Liners	On piston and rod (9BA) . . .	BZ No. 4	
H12C	1	Liner, left	Elevating slide	BZ No. 2	
H12B	1	Liner, right	do.	BZ No. 2	
18S	4	Link pins	In tripping links (18P) . . .	BZ No. 3	
9CA	1	Locking disk	On top of piston rod (9BA) .	Bz	
18CA2	2	Locking levers	On locking lever pins (18BA1) .	FS No. 2	
18BA1	2	Locking lever pins	In chassis	FS No. 2	
18B	2	Locking links	Buffer Yokes (H7BA1) (H7CA1) .	S	Connecting yokes to locking lever.
18L	2	Locking link pins	In locking links (18B) . . .	Bz	
18M	2	do.	do.	Bz	1.8125 long.
18AA1	2	Locking lever pin collars . . .	On locking lever pins (18BA1) .	S	
9R	1	Lock screw	In piston and rod (9BA) . . .	S	
13GA	2	Loops	On retracting rope	FS	
9B	1	Name plate No. 1	On top carriage	Bz	
9C	1	Nut	On piston rod	FS No. 3	
H12M	1	do.	do.	FS No. 3	
H13C1	1	do.	Elevating slide stop	S	
H6X	1	do.	Equalizing bar fork	S	
17R	2	do.	On safety latch pin (18A) . . .	S	
	2	do.	On buffer rod cups (H6W1) . . .	S	
	2	do.	On roll pins (17Q)	S	
	2	do.	On pawl fulcrums (18G)	S	
	2	do.	On locking lever pins (18BA1) .	S	
H6V	36	do.	On roller axles (H6K1)	S	
9U	1	Oil gutter	On piston rod beam	Bi	For oil in recoil cylinder.
Q3C	125	Oil plugs, 0.375 standard . . .	For carriage	Bz	Including extras.
Q3B	17	Oil plugs, 0.25 standard . . .	do.	Bz	Do.
	1	Padlock, Yale, standard, No. 853 .	On hasp bracket	Comm	For recoil valve.
18K1	2	Pawls	On pawl fulcrums (18G)	FS No. A	For racks on cross-head.
18G	2	Pawl fulcrums	In chassis	FS No. 3	
18R2	1	Pawl lever, left	On pawl fulcrum (18G)	FS No. 2 or CS No. 2	
18Q2	1	Pawl lever, right	do.	FS No. 2 or CS No. 2	
20CA	18	Packing rings	In recoil cylinder (9G)	GWHP	6 extra.
	4	Pinch-bar hooks	On side of sighting platform .	FS	
	2	Pins	In bushings (18HA)	Bz	
	2	do.	In bushings (18EA)	Bz	
	4	do.	In bushings (18J)	Bz	
	4	do.	In bushings (18H)	Bz	
17K	3	do.	In lever (17J) and clutch rod (17L) .	Bz	
17H	1	do.	In latch (17G1)	Bz	
17C	1	do.	In fulcrum (17B)	Bz	
	2	do.	In bushings (16B) (16V)	Bz	
	1	do.	In bushing (16J)	Bz	
	1	do.	In bushing (16M)	Bz	
16L	1	do.	In lower traversing bearing . .	FS No. 3	
	2	do.	In bushings (H18N)	Bz	
13MA	20	do.	In retracting rope	S	
13KA	1	do.	In shipper handle	S	
13FA	1	do.	In retracting shipper	S	
13CA	1	do.	In retracting brake lever . . .	S	
13Y	1	do.	In retracting shipper	S	
	3	do.	Retracting drum shaft gear . .	S	
	4	do.	In bushings (12A)	Bz	
	3	do.	In strips on pointer (11P1) . .	GS	
	2	do.	In pointer (11P1)	Bz	
	1	do.	In stud (11G)	S	
	2	do.	In elevation disk gear and chassis .	S	
	1	do.	In intermediate gear (11B1) . .	S	
	20	do.	For rope of counterbalance device .	S	
	4	do.	In bushings (H13G) (H13H) . .	Bz	
	8	do.	In bushing (H16G)	Bz	
H16K	1	do.	Elevating band	S	
	1	do.	Rope clamps (H12F) (H12G) . .	S	
	1	do.	Elevating slide stop	S	
	8	do.	In bushings (H12E)	Bz	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905-MII—Continued.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks.
	2	Pins	In body (9EA).....	Bz	Riveted.
	1	do	In plug (9E).....	S	
	72	do	In bushings (H6C).....	S	
	32	do	For rack retaining screws (H6E).....	S	
	72	do	In gears (H6A1).....	S	
	32	do	In clip bolts (7R), (7S).....	S	
	2	do	In bushing (8L).....	Bz	
	1	do	In bushing (8C).....	Bz	
	2	do	For bushing (5A).....	Bz	
	2	do	For bushing (4G).....	Bz	
	2	do	For bushing (4F).....	Bz	
4C	52	do	For rack retaining screws (4B).....	S	
11J1	1	Pinion	On elevating shaft.....	S	
9BA	1	Piston and rod	In recoil cylinder (9G).....	FS No. 3	
H15C	1	Piston rod beam	Between guide frames.....	CS No. 2	
H15G	1	Piston-rod bracket	On front transom	CS	
H14G	10	Plates	In racer	CI	Leaded in.
20PA	1	do	Sighting platform	S	Left side.
20NA	1	do	do	S	Do.
20Z	2	Platform braces	Subcaliber platform	S	Complete.
20LA1	1	Platform bracket, left	On left chassis	CS	
20KA1	1	Platform bracket, right	On right chassis	CS	
20C2	1	Platform floor, left	Sighting platform	S	0.25 plate.
20B	1	Platform floor, right	do	S	Do.
20J	1	Platform fulcrum, left	Subcaliber platform	FS	
20H	1	Platform fulcrum, right	do	FS	
20F	1	Platform frame	do	S	Complete.
20E	1	Platform plate	do	S	0.125 plate.
20Y	2	Platform supports	Sighting platform	S	For subcaliber platform.
18QA	2	Plugs	In plungers (18F2).....	Bz	
18F2	2	Plungers	In pawl levers (18Q2), (18R2).....	S	
18FA	2	Plunger springs	On plungers (18F2).....	SpS	
11P1	1	Pointer	In pointer base	Bz	For elevation and range scale.
11Q1	1	Pointer base	On left chassis	Bz	
20N	14	Post feet	Sighting and subcaliber plat- forms	CS or FS	
9E	1	Plug	In upper cylinder head (9Q).....	S	
H14A	1	Racer	On traversing rollers	CI No. 2	
H14B	1	Racer liner	On racer	Bz	In 4 sections.
19F	2	Racer cover plates	do	S	
19H	1	Racer plate, right	do	S	
19P	1	Racer plate, left	do	S	0.375 plate.
4E	2	Racks, left	On chassis	FS No. 3	Do.
H6H1	2	do	On top carriage	FS No. 3	
4D	2	Racks, right	On chassis	FS No. 3	
H6G1	2	do	On top carriage	FS No. 3	
H6E	32	Rack retaining screws	In top carriage	S	
4B	52	do	In chassis	S	
	16	Railing pieces	Sighting and subcaliber plat- forms	WI	
	14	Railing posts	do	WI	
H13M1	1	Rear clip and traversing bracket	On racer	CS No. 1	
9G	1	Recoil cylinder	In counterweight	FS No. 3	
10F1	2	Recoil pointers	On chassis	Bz	
10G	2	Recoil scales	On guide clips	Bz	
13PA	1	Retracting brake lever	On retracting brake lever stud	FS	
13SA	1	Retracting brake lever stud	In left chassis	S	
13TA	1	Retracting brake lever stop	do	S	
13QA	1	Retracting brake strap	On retracting brake lever	S	Around retracting brake wheel.
13NA	1	Retracting brake wheel	On retracting drum shaft	CI No. 2	
12R1	1	Retracting clutch	Retracting drum shaft	CS No. 1	
12S	1	Retracting clutch spring	do	SpS	
12G	1	Retracting crank shaft pinion	On retracting crank shaft	FS No. 3	
12FA	2	Retracting cranks	do	FS	
12JA	2	Retracting crank fasten- ings	Retracting cranks	S	Complete chain and pin.
12EA	1	Retracting crank shaft	In chassis	FS No. 3	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks.
13AA	2	Retracting crank shaft brackets.	On chassis.....	CI	
12U	1	Retracting drum shaft....	In chassis.....	FS No. 3	
26A	1	Retracting drum, right....	On retracting drum shaft....	CI No. 2	Left-hand groov- ing.
12Y	1	Retracting drum, right gear.	Retracting drum shaft....	CI No. 2	
26B	1	Retracting drum, left....	On retracting drum shaft....	CI No. 2	Right-hand groov- ing.
12N	1	Retracting intermediate shaft.	In chassis.....	FS No. 3	
12F	1	Retracting intermediate shaft gear.	On retracting intermediate shaft.	CI No. 2	
12B	1	Retracting intermediate shaft pinion.	.....do.....	FS No. 3	
13L	1	Retracting pawl.....	On retracting pawl shaft....	FS	
13H	1	Retracting pawl lever.....	.....do.....	FS	
13K	1	Retracting pawl shaft....	In right chassis.....	S	
13BA	1	Retracting ratchet.....	On retracting crank shaft....	FS	
13X	1	Retracting shipper.....	Attached to rear transom....	FS	For retracting clutch.
13JA	1	Retracting shipper rod....	On retracting shipper.....	FS	
13U	2	Retracting shipper swivel.	Retracting shipper.....	Bz	
	2	Rivets.....	In retracting drum shaft....	S	
	8	.....do.....	In brake lever strap.....	S	
	2	.....do.....	In traversing crank shaft....	S	For keys.
	7	.....do.....	In fulcrum (17B) and spring stirrup.	S	0.375 diameter.
	4	.....do.....	In spring brackets (18MA), (18NA).	Br	Do.
	2	.....do.....	In plungers (18F2).....	Bz	0.125 diameter.
118	.....do.....	Subcaliber and sighting platforms.	.....do.....	S	0.375 diameter.
32	.....do.....	In ladder sides (20W), (20X).	.....do.....	S	Do.
12	.....do.....	Sighting platforms.....	.....do.....	S	0.5 diameter.
14	.....do.....	In railing post feet.....	.....do.....	S	0.25 diameter.
8	.....do.....	In subcaliber platform braces.	.....do.....	S	Do.
12	.....do.....	In bottom plate liners.....	.....do.....	Bz	
8	.....do.....	Outer dust guard.....	.....do.....	WI	0.375.
4	Rivets, countersunk.....	In liners (9W).....	Br		
1	.....do.....	In hasp (9DA).....	S		
12	.....do.....	In recoil scales.....	Bz		
14	.....do.....	In liners (H12B), (H12C).....	Br		
H6D	18	Rollers.....	Under top carriages.....	FS No. 3	
H6F	18	.....do.....	Under top carriage.....	FS No. 3	
17P	2	.....do.....	On roller pins (17Q).....	Bz	
H6K1	36	Roller axles.....	In rollers (M6D), (H6F).....	FS No. 3	For clutch fork.
H23B	3	Roller bearings.....	Elevating gear.....	S	
H23C	4	.....do.....	Traversing gear.....	S	
H23E	2	.....do.....	.....do.....	S	
H23D	4	.....do.....	Retracting gear.....	S	Without sleeve on shaft.
H23H	4	.....do.....	.....do.....	S	Do.
H23J	2	.....do.....	.....do.....	S	Do.
H6N	2	Roller cage side frames.....	For roller under top carriage.	FS No. 2	Inside.
H6P	2	.....do.....	For rollers under top carriage	FS No. 2	Outside.
17Q	2	Roller pins.....	In clutch fork (17N).....	S	
H13R	1	Rope.....	For counterbalance device....	S	
13HA1	2	Ropes.....	For retracting.....	S	
26D	4	Rope clamps.....	On retracting drums.....	FS	
H12G	1	Rope clamp, left.....	On elevating slide.....	S	
H12F	1	Rope clamp, right.....	.....do.....	S	
13M	1	Rope sheave bracket.....	On chassis.....	CI	Right.
13N	1	.....do.....	.....do.....	CI	Left.
13DA	2	Rope sheaves.....	In rope sheave brackets.....	CI	
13A	2	Rope sheave pins.....	Rope sheave brackets.....	FS	
H13Q	2	Rope socket pins.....	In clevises.....	FS	
13P	1	Rope trough.....	Inside chassis.....	S	Right.
13Q	1	.....do.....	.....do.....	S	Left.
18C	1	Safety latch.....	On safety latch pin.....	CS	
7W	1	Safety latch dog.....	On guide clip (7P1).....	S	On left side.
18A	1	Safety latch pin.....	In left chassis.....	Bz No. 3	For safety latch.
11AA1	24	Screws.....	Elevation disk.....	GS	0.25 by 0.75.
11CA	1	.....do.....	In pointer base.....	Bz	0.375 by 0.718.
H23U	27	Screws, countersunk.....	In direction plates.....	Bz	0.25 by 0.625.
19B	8	.....do.....	In racer cover plates.....	S	0.5 by 1.
17CA	2	.....do.....	In latch pedal (17BA).....	S	0.375 by 0.75.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
H16D	18	Screws, countersunk	Washers (H16B), (H16C)....	Bz	
9X	2	do.	In hasp bracket (9Y).....	S	0.375 by 1.
8S	32	do.	In bushings (8G).....	Bz	0.5 by 1.125.
8C	24	do.	In washers (8B).....	Bz	0.375 by 0.625.
H6R	16	do.	In axle bed bushings (H6S), (H6T).	Bz	0.5 by 1.125.
7BA	5	do.	In safety latch dog (7W)....	Bz	0.5 by 1.375.
7X	12	do.	In crosshead gibs.....	Bz	Do.
H14F	6	do.	In racer.....	Bz	To close oil holes.
H14C	32	do.	In racer liner.....	Bz	0.5 by 1.
	2	Screw eyes	Retracting cranks.....	S	Holding chain o fastenings.
	2	Screws, flat-head cap	In name plate No. 1.....	Bz	0.25 by 0.375.
9Z	1	Screws, fillister head	In upper end of piston and rod.	S	0.375 by 0.5.
H18H	60	do.	In traversing rack.....	S	0.5 by 1.
H16A	1	Set screws.....	In lower end of elevating arm.	S	
19E	2	do.	In sight standard.....	S	0.75 by 2.75.
13W	2	Special screws.....	Retracting shipper.....	S	For pivot.
18X	1	Shaft.....	Through chassis.....	S	
17E	1	Shank.....	In spring stirrup (17F)....	S	Part of clutch plunger.
13LA	1	Shipper handle.....	Through chassis.....	Bz	On retracting shipper rod.
17V	1	Shoulder bracket, left.....	On shoulder rest.....	Bz	
17U	1	Shoulder bracket, right.....	do.	Bz	
17S	1	Shoulder rest.....	In traversing handwheel shaft gear cover.	FS	
19D	1	Sight-arm bracket.....	On sight standard.....	CS No. 1	Not used on carriages after No. 21.
19L	1	Sight standard.....	On left chassis.....	CS	
19L1	1	do.	do.	CS	For carriages after No. 21.
19C	2	Sight-arm bracket pins....	In sight-arm bracket (19D)..	S	Not used on carriages after No. 21.
14J	1	Sleeve.....	Traversing handwheel handle.	Bz	
11X	1	do.	Elevating handwheel handle	Bz	
	2	Split pins.....	In crown nuts (6V).....	S	
	8	do.	For crown nuts.....	S	In suspension rod.
	1	do.	In nut (9B).....	S	
	1	do.	In taper pin.....	S	In nut (9C).
	1	do.	In nut (H12M).....	S	
	1	do.	In taper pin.....	S	For elevating screw.
	1	do.	do.	S	For spring compressor nut.
	1	do.	In pin (H16K).....	S	
	2	do.	In nuts on bolts.....	S	For elevating band.
	2	do.	In taper pins.....	S	For band trunnions.
	1	do.	In nut (H13C1).....	S	
	2	do.	In equalizing bar pin.....	S	
	2	do.	In rope socket pin.....	S	
	2	do.	In taper pins.....	S	For collars (H13L).
	2	do.	Upper guide sheave axle (H13T).	S	
	1	do.	In taper pin.....	S	Rear clip and traversing bracket.
	1	do.	do.	S	For collar (11E).
	1	do.	do.	S	For collar (11H).
	1	do.	In crown nuts (11S).....	S	
	6	do.	Elevating shaft.....	S	
	4	do.	Retracting intermediate shaft.	S	
	2	do.	Retracting crank shaft.....	S	
	2	do.	Retracting drum shaft.....	S	
	2	do.	In taper pins.....	S	For collars (13B).
	4	do.	do.	S	Idler sheave pins.
	2	do.	do.	S	Retracting pawl shaft.
	1	do.	In pin (13Y).....	S	
	2	do.	In pin (13CA).....	S	
	1	do.	In pin (13FA).....	S	
	1	do.	In retracting shipper rod....	S	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
	1	Split pins.....	In taper pin.....	S	For retracting brake wheel.
	1	.....do.....	.....do.....	S	For collar (13RA).
	1	.....do.....	In retracting break lever stud.	S	
	6	.....do.....	In taper pin.....	S	For traversing crank shaft.
	2	.....do.....	In crown nuts (14F).....	S	
	1	.....do.....	In crown nut (14L).....	S	
	1	.....do.....	In taper pin.....	S	For collar (14M).
	1	.....do.....	In crown nut (14P).....	S	
	2	.....do.....	In crown nuts (14T).....	S	
	1	.....do.....	In taper pin.....	S	For collar (16P).
	2	.....do.....	In pin (17C).....	S	
	3	.....do.....	In pins (17K).....	S	
	1	.....do.....	In clutch-rod end (17M).....	S	
	1	.....do.....	In taper pin.....	S	For shoulder rest.
	1	.....do.....	In crown nut.....	S	For bolt (17T).
	4	.....do.....	In locking link pins (18L) (18M).	S	
	2	.....do.....	In taper pin.....	S	For tripping cranks.
	4	.....do.....	In link pins (18S).....	S	
	1	.....do.....	In taper pin.....	S	For lever (18W).
	1	.....do.....	.....do.....	S	For collar (18Z).
	2	.....do.....	.....do.....	S	For locking lever pin collars.
	2	.....do.....	In plungers (18F2).....	S	
	2	.....do.....	In crown nuts.....	S	For sight arm bracket pins.
	2	.....do.....	In brace pins (20M).....	S	
	1	.....do.....	In taper pin.....	S	For retracting drum (left).
	1	.....do.....	.....do.....	S	For foot piece (17D).
11M	1	Spiral spring.....	Elevation disk gear.....	SpS	
25D	1	Spiral spring retainer.....	On spring retainer bracket.....	Bz	
25F	1	Spiral spring retainer (for gear).....	On elevation disk gear.....	Bz	For carriages Nos. 20 and 21.
18NA	1	Spring bracket, left.....	On locking lever (18CA2).....	Bz	
18MA	1	Spring bracket, right.....	.....do.....	Bz	
18KA	2	Spring plungers.....	In spring brackets (18MA) (18NA).....	S	
25A	1	Spring retainer bracket.....	On left chassis.....	CS	
17F	1	Spring stirrup.....	Under left sighting platform.....	Bz	
17A	1	Spring.....	In spring stirrup (17F).....	S	
H12K	1	Spring compressing nut.....	In elevating slide.....	FS No. 3	
	2	Staples.....	For bottom plate (7J).....	FS	
	10	.....do.....	For seventh and eighth layers of weights (7E) (7F).	FS	
	12	.....do.....	For 6 large weights.....	FS	
9EA	1	Stem.....	In piston rod (9BA).....	S	
11V	1	.....do.....	Elevating handwheel handle.....	S	
14K	1	.....do.....	Traversing handwheel handle.....	S	With washer.
13J	1	Stop.....	In right chassis.....	S	
17Z	2	Strips.....	On shoulder brackets.....	Bz	Holding tube (17Y).
	3	.....do.....	In pointer (11P1).....	GS	Pinned in place.
H4G	1	.....do.....	Outer dust guard (H4D).....	S	In 4 pieces.
H4J	1	.....do.....	Inner dust guard.....	S	In 4 sections.
	4	.....do.....	Outer dust guard.....	F	
	1	.....do.....	Inner dust guard.....	F	
6H	2	Studs.....	In rear transom.....	S	1.125 by 4.875.
11G	1	.....do.....	In left chassis.....	S	
8D	4	Studs with nuts.....	In gun levers.....	S	1.5 by 6.375.
8E	4	.....do.....	.....do.....	S	1.5 by 6.75.
8F	4	.....do.....	.....do.....	S	1.5 by 6.
7U	4	Suspension rods.....	For counterweight.....	FS No. 3	
4J	2	Taper dowel pins.....	In right chassis.....	S	
5B	2	.....do.....	In left chassis.....	S	
	1	Taper pins.....	In nut (9C).....	S	
	1	.....do.....	In elevating screw.....	S	
	1	.....do.....	Spring compressor nut.....	S	
	2	.....do.....	In band trunnions.....	S	
	2	.....do.....	In collars (H13L).....	S	
	1	.....do.....	For rear clip and traversing bracket.	S	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 Mm, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 Mm—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
	1	Taper pins.....	In collar (11E).....	S	
	1	do.....	In collar (11H).....	S	
	6	do.....	Elevating shaft.....	S	
	1	do.....	In pointer base.....	S	
	1	do.....	In collar (11DA).....	S	
	4	do.....	Retracting intermediate shaft.....	S	
	2	do.....	Retracting crank shaft.....	S	
	2	do.....	Retracting drum shaft.....	S	
	2	do.....	In collars (13B).....	S	
	4	do.....	In idler sheave pin.....	S	
	2	do.....	Retracting pawl shaft.....	S	
	1	do.....	In retracting brake wheel.....	S	
	1	do.....	In collar (13RA).....	S	
	5	do.....	In collars (14C).....	S	For traversing crank shaft.
	1	do.....	In collar (14M).....	S	
	1	do.....	In traversing crank shaft pinion.....	S	
	1	do.....	In traversing handwheel shaft pinion.....	S	Held in by split pin.
	1	do.....	In collar (16F).....	S	
	1	do.....	In shoulder rest.....	S	
	1	do.....	In foot piece (17D).....	S	
	2	do.....	In tripping cranks (18N1).....	S	
	1	do.....	In lever (18W).....	S	
	1	do.....	In collar (18Z).....	S	
	2	do.....	In locking lever pin collar.....	S	
	1	do.....	In retracting drum (left).....	S	
20S	8	Tees.....	Platform railings.....	MI	
9H1	2	Throttling bars.....	In recoil cylinder (9G).....	FS No. 2	
H3F	12	Thrust plates.....	Under base ring.....	S	
H6U2	1	Top carriage.....	On chassis.....	CS No. 2	
6K	1	Transom cap.....	On rear transom.....	CS No. 1	
6R1	1	Transom, front.....	Between chassis.....	CS No. 1	
6J1	1	Transom, rear.....	do.....	CS No. 1	
14R	1	Traversing crank.....	On traversing crank shaft.....	FS	
14S	1	Traversing crank fastening, complete.....	Traversing crank.....	S	Consisting of split pin, chain, screw eye.
H18A	1	Traversing crank shaft gear.....	On traversing pinion shaft.....	CI No. 1	Provided with felt washer.
H18B	1	Traversing crank shaft pinion.....	On traversing crank shaft.....	FS No. 2	
H18Q2	1	Traversing clutch gear.....	do.....	S	Do.
H18P	1	Traversing clutch pinion.....	On traversing intermediate shaft.....	FS No. 2	
H18W1	1	Traversing clutch.....	On traversing crank shaft.....	BZ No. 4	
16H	1	Traversing clutch gear cover.....	Over traversing clutch gears.....	CI	In halves.
16T	1	Traversing crank shaft gear cover.....	Over traversing crank shaft gears.....	CI	Do.
16S	1	Traversing bearing, lower.....	On left chassis.....	CI	
16K	1	Traversing bearing, upper.....	On right standard.....	CI	
16D	1	Traversing handwheel shaft gear cover.....	Over traversing handwheel shaft gears.....	CI	Do.
H18V	1	Traversing handwheel shaft gear.....	On traversing intermediate shaft.....	CI No. 1	Provided with felt washer.
H18U	1	Traversing handwheel shaft pinion.....	On traversing handwheel shaft.....	FS No. 2	
14E	1	Traversing handwheel shaft.....	In upper traversing bearing.....	FS No. 1	
14H	1	Traversing handwheel.....	On traversing handwheel shaft.....	Bz	
14N	1	Traversing intermediate shaft.....	In traversing bearings.....	FS No. 1	
14B	1	Traversing crank shaft.....	Through chassis.....	FS No. 1	
H18G	1	Traversing pinion.....	On traversing pinion shaft.....	FS No. 2	
14U	1	Traversing pinion shaft.....	In rear clip and traversing bracket.....	FS No. 1	Do.
H18J	1	Traversing rack.....	On base ring.....	S	
H3B	2	Traversing stops.....	do.....	S	
H3A	18	Traversing stop bolt hole plugs.....	In base ring.....	S	In 6 sections.
H4B	24	Traversing rollers.....	Between racer and base ring.....	FS No. 3	
18N1	2	Tripping cranks.....	On shaft (18X).....	FS No. 2 or CS No. 2	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks.
18T	1	Tripping crank stop.....	In left chassis	S	
18P	2	Tripping links.....	Attached to tripping cranks (18N1).	S	Connecting to pawl levers.
18GA1	1	Tripping lever latch, left..	On locking lever pin (18BA1)	FS No. 2	
18FA1	1	Tripping lever latch, right..	do.	FS No. 2	
18U	1	Tripping lever stop.....	On racer	SpS	
13D	2	Trough brackets.....	On chassis	WI	
9K	1	Tubes.....	In upper cylinder head (9Q).	C	
17Y	2	do.	In shoulder brackets	R	To rest shoulders against.
14Q	1	Tubings.....	On traversing crank	Br	
12BA	2	do.	Retracting cranks	Br	
H14D	12	Tubes, oil.	In racer	S	
H14E	14	do.	do.	Br	
9AA	1	Valve stem nut.	In piston rod (9BA).	BZ No. 4	
H12L1	1	Washers	Elevating slide stop	S	
	1	do.	On pin (H16K).	S	
11K1	1	do.	In correction screw.	S	
11W	1	do.	Elevating handwheel handle	S	
	1	do.	Retracting intermediate shaft gear.	F	
	1	do.	In collar	F	Retracting drum shaft.
	1	do.	On retracting shipper rod	S	
	1	do.	In retracting brake wheel	F	
	1	do.	In retracting ratchet	F	
	1	do.	On traversing handwheel shaft.	Bz	
	1	do.	On traversing crank	S	Riveted on.
H18C	1	do.	On traversing crank shaft	Bz	With felt washer.
H18D	1	do.	On elevating shaft	Bz	Do.
	1	do.	Traversing pinion (H18G).	F	
	1	do.	Traversing clutch gear (H18Q2).	F	
	1	do.	Traversing handwheel shaft gear.	F	
	1	do.	In washer (H18C).	F	
	1	do.	In washer (H18D).	F	
	1	do.	Traversing crank shaft gear (H18A).	F	
	5	do.	In collar (14C).	F	
	3	do.	In collars	F	Retracting crank shaft.
	3	do.	do.	F	Retracting intermediate shaft.
	2	do.	On retracting cranks	S	Riveted on.
	6	do.	Elevating shaft	F	
11EA	2	do.	On bolts (11R).	S	
H16	4	do.	Elevating arm	Bz	
H16B	2	do.	do.	Bz	
8B	4	do.	In lower end of gun levers	Bz	
H4F	4	do.	Outer dust guard	S	
H13E	1	Weight	For counterweight device	CI	

COUNTER RECOIL SYSTEM 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII.

10D	4	Bolts, tap.....	In clamps (10C).	S	0.5 by 1.
10E	2	do.	In buffer valve body	S	0.75 by 2.
H7P	8	do.	Buffer cylinders	S	1.25 by 2.875.
H7M1	1	Buffer cylinder, left	On chassis	CS No. 1	
H7L1	1	Buffer cylinder, right	do.	CS No. 1	
H7D2	1	Buffer followers	Buffer stuffing boxes (H7C).	FS No. 2	
H7Z	4	Buffer glands	Inside buffer followers	BZ No. 3	
H7J	2	Buffer piston liners	On buffer pistons	BZ No. 3	
H7H1	2	Buffer pistons and rods	In buffer cylinders	FS No. 2	
H7K	4	Buffer springs	On each side of buffer cylinders	S	
H7B	4	Buffer spring covers.....	Surrounding buffer springs (H7K).	Br	Seamless drawn tube.
H7A	4	Buffer spring rings.....	Inside buffer spring covers (H7B).	FS	Provide a seat for buffer spring.
H7E	4	Buffer spring rods.....	In buffer springs (H7K).	FS	
H7F2	4	Buffer spring supports....	On end of buffer spring rods (H7E).	FS	
H7C	4	Buffer stuffing boxes.....	In ends of buffer cylinders	BZ No. 3	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

COUNTER RECOIL SYSTEM 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII—Contd.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
H7CA1	1	Buffer yoke, left.....	On buffer piston rod.....	CS No. 1	Connected to buffer spring rods. Do. For holding equalizing and throttling pipe.
H7BA1	1	Buffer yoke, right.....	do.....	CS No. 1	
10C	2	Clamps.....	Inside front transom.....	S	
H8D	8	Collars.....	Pipe connections.....	C	To replace equalizing and throttling pipes to continue piece in action after their injury. Graduated to indicate valve setting.
	4	Couplings.....	Equalizing and throttling pipes to buffer valve.	FS No. 1	
H7R	4	Cylinder plugs.....	Buffer cylinders.....	Bz	
H8C	1	Disk.....	Buffer valve.....	BZ No. 2	To empty counter recoil system. Each piece approximately 47 inches long.
H8J	1	Emptying plug.....	do.....	FS No. 1	
10A	2	Equalizing and throttling pipes.	Connects buffer cylinders to buffer valve.	C	
10B	2	do.....	do.....	C	Each piece approximately 63 inches long.
H7Q	4	Filling plugs.....	Buffer cylinders.....	Bz	Including 2 extra. Connect to buffer cylinder.
H8E	4	Followers.....	Equalizing and throttling pipes.	BZ No. 4	
H8T	1	do.....	Around valve stem (H8B)...	Bz	
	8	Gaskets.....	Pipe connections.....	FVF	To prevent change in setting of buffer valve.
	4	do.....	Filling plugs.....	FVF	
	4	do.....	Buffer stuffing boxes (H7C)...	C	
H8K1	1	Gland.....	Around valve stem (H8B)...	Bz	1 extra. 4 extra. Riveted in. Do.
	1	Padlock, Yale standard, No. 853.	Through hole in valve stem (H8B).	Comm	
	5	Packing rings.....	Buffer valve.....	GWHP	
	24	do.....	Buffer cylinders.....	GWHP	0.1875 diameter. 0.25 by 0.625.
	1	Pins.....	In disk (H8C).....	Bz	
	2	do.....	In buffer piston liners.....	Bz	
	8	Rings.....	Pipe connections.....	S	Buffer yokes. Do. For buffer spring supports. 1.25 by 4.5.
	2	Rivets.....	In valve stem.....	Bz	
	2	Screw pins.....	In disk (H8C).....	S	
	1	Split pin.....	In valve stem (H8B).....	S	Through piston rods. Through spring rods
	4	do.....	In taper pin.....	S	
	2	do.....	do.....	S	
	4	do.....	do.....	S	Through piston rods. Through spring rods
H7AA	4	Studs, with nuts.....	Buffer cylinders.....	S	
	4	Taper pins.....	Buffer spring supports.....	S	
	2	do.....	In buffer yokes.....	S	1 shank BZ No. 4. 1 tip FS No. 1.
	4	do.....	do.....	S	
H8G	1	Valve body.....	On front transom.....	BZ No. 4	
H8A1	1	Valve handle.....	Buffer valve.....	BZ No. 2	Seat for valve stem.
H8L	1	Valve seat.....	do.....	FS No. 2	
H8B	1	Valve stem.....	In valve body (H8G).....		
H8H	1	Washer.....	do.....	S	

AZIMUTH POINTER 6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII.

H5P	1	Azimuth circle.....	On top of base ring.....	Br	In 6 sections.
H5C1	1	Azimuth pointer body.....	In opening of racer.....	Bz	
H5J	1	Collar.....	On screw (H5K).....	Bz	
H5G	1	Coaming.....	On racer.....	CS	Graduated.
	1	Dowel.....	For scale (H5D).....	GS	
H5A	1	Index.....	In azimuth point body.....	GS	
	2	Index marks.....	Azimuth pointer body.....	GS	Attached to slide (H5R). Soldered on covers.
H5F	1	Lid.....	On coaming (H5G).....	CS	
H5E	1	Nut.....	On screw (H5K).....	Bz	
H5S	1	Pin.....	In coaming (H5G).....	S	Azimuth pointer. Carriage slide (H5R).
	1	do.....	In sleeve (H5L).....	GS	
H5D	1	Scale.....	In azimuth pointer body.....	GS	
H5N	2	Screws.....	do.....	Br	0.5 by 1.125.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

AZIMUTH POINTER 6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Contd.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
H5K	1	Screws.....	In azimuth pointer body....	Bz	
H5B	1	Screw, countersunk.....	In index (H5A).....	G8	0.25 by 0.625.
H5H	12	.....do.....	In coaming (H5G).....	Bz	0.5 by 1.
H5Q	42	.....do.....	In azimuth circle.....	Br	0.25 by 0.75.
H5M	1	Sleeve, left.....	On screw (H5K).....	G8	Graduated.
H5L	1	Sleeve, right.....	.....do.....	G8	Do.
H5R	1	Slide.....	In azimuth pointer body....	Bz	
	1	Taper pin.....	In sleeve (H5M).....	G8	

ELECTRICAL EQUIPMENT 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII.

T88H	1	Azimuth lamp bracket.....	In racer.....	Bz	Azimuth lamp.
V27K	1	Base.....	In terminal box.....	Slate	
V27W	1	.....do.....	Under conduit (V27R).....	S	Part of conduit strap.
V27T	6	Bolts.....	For terminals (V27S).....	Bz	0.25 by 2.125.
V27X	2	Bolts, expansion.....	In base (V27W).....	S	
V27H	4	Bolts, tap.....	For terminal box.....	S	0.625 by 1.75.
V27AA	2	.....do.....	In strap (V27Y).....	S	0.625 by 1.125.
E20C	2	.....do.....	In plug box (E20B).....	S	0.25 by 0.875.
T91R	2	.....do.....	In strap (T91E).....	S	For carriages with telephone.
H24E	4	.....do.....	For braces (H24H) (H24M).....	S	0.625 by 1.5.
V27G	4	.....do.....	For terminal box.....	S	Do.
T91R	20	.....do.....	In straps (T91L) (T91E) (T91J) (T91N) (T91Q) (T91C) (T91G).....	S	0.5 by 1.
T88F	2	.....do.....	In bracket (T88R).....	S	Do.
E12AA	2	.....do.....	For twisted hooks (E12Y).....	S	0.375 by 0.625.
E14D	2	.....do.....	For hook (E14C).....	S	0.5 by 1.25.
T24T	4	.....do.....	In junction box cover (T24Q).....	S	0.5 by 0.75.
T24S	4	.....do.....	In junction box (T24V1).....	S	0.5 by 1.25.
	2	.....do.....	In conduit support (T24U).....	S	0.5 by 1.
T25CK	2	.....do.....	In shade support (T25CJ).....	S	0.5 by 0.875.
T25C	4	.....do.....	In shades (T25BT2).....	S	0.5 by 1.
T25BL1	2	.....do.....	In junction box (T25CB).....	S	0.5 by 2.75.
T88C	2	.....do.....	In brackets (T88B).....	S	0.5 by 1.
T88A	1	Bolt, with nut.....	.....do.....	S	0.5 by 1.75.
T88B	1	Bracket.....	In counterweight well on piston-rod beam.	S	
T25CH	3	Bolts, with nuts.....	In shade (T25CG).....	S	0.25 by 0.75.
T88R	1	Bracket.....	On left chassis.....	S	To support switch (E13AE3).
H24M	2	Braces, lower.....	.....do.....	S	For carriages with telephone.
H24H	2	Braces, upper.....	.....do.....	S	Do.
T85S	1	Bushing.....	On elbow (T85Q).....	Bz	Part of plug connection.
V23MM	1	.....do.....	In gun outlet box.....	Comm	For carriages with telephone.
V23BM	1	Bushing, 1 by 0.5.....	In cross (V23BF).....	Comm	
V23EM	2	Bushings, 1 by 0.75.....	.....do.....	Comm	
V23AM	1	Bushing, .75 by 0.5.....	In plug box (E20B).....	Comm	
E12U	2	Bushings.....	On 0.5 conduit.....	Bz	At buffer and recoil valves.
	1	Bolt, with nut.....	In conduit support (T24U).....	S	0.5 by 2.
	1	Cable, lighting.....	From plug connection to lamps at sight.	C	
E12X	2	Cable thimbles.....	On cable to sight.....	GI	
E13AJ1	6	Candelabra receptacles.....	For lamps (E12NA) and (E9H).....	Comm	
T85M	1	Cap.....	Attached by chain to elbow (T85Q).....	Bz	
T85U	1	Chuck, in halves.....	In plug casing (T85L).....	Bz	Part of plug connection.
	1	Conduit.....	From flexible conduit in counterweight well to junction box (T24V1).....	S	1 inch loricated.
	1	.....do.....	From junction box (T24V1) to junction box (T25CB).....	S	Do.
	1	.....do.....	From junction box (T2D) to cross (V23BF).....	S	Do.
	1	.....do.....	From coupling (V23BA) to junction box (T25CB) to coupling (V23BA) at Cross (V23BF).....	S	0.75 inch loricated.

Names of parts of 6-inch disappearing carriage, L. F. model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

ELECTRICAL EQUIPMENT 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII—Contd.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
	1	Conduit.....	From cross (V23BF) to coupling (V23BA) on left chassis.	S	0.75 inch loricated.
	1	do.....	From elbow (V23CL) to tee (V23AE) on left chassis.	S	Do.
	1	do.....	From coupling (V23BA) at junction box (T24V) to coupling (V23BA).	S	Do.
	1	do.....	From cross (V23BF) into racer.	S	0.5 inch loricated.
	1	do.....	From coupling (V23AA) on front transom to coupling (E12U) on piston rod bracket.	S	Do.
	1	do.....	From coupling (V23AA) to plug connection on sight standard.	S	Do.
	1	do.....	From coupling (V23AA) at junction box (T25CB) to 16-candlepower lamp on rear transom.	S	Do.
	1	Conduit, in two pieces.....	From coupling (V23AA) to coupling (E12V) near elevation disk lamp.	S	Do.
	1	do.....	From tee (V23AC) on left chassis to tee (V23AC) on front transom.	S	Do.
	1	do.....	From junction box (T25CA) to plug box (E20B).	S	Do.
	1	do.....	From tee (V23AE) to tee (V23AC) on left chassis.	S	Do.
V27N	2	Conduit fittings.....	On conduit (V27R).....	Bz	Right and left.
V27R	1	Conduit, flexible metallic.....	In counterweight well.....	S	Do.
T24U	1	Conduit support.....	On piston rod bracket (H15G).	S	Do.
V23AA	8	Couplings, 0.5.....	On 0.5 conduit.....	Comm	Right and left.
V23BA	5	Couplings, 0.75.....	On 0.75 conduit.....	Comm	Do.
V23JA	4	Couplings, 1.....	On 1 conduit.....	Comm	Do.
E12V	2	Couplings, 0.5.....	On 0.5 conduit.....	Bz	At elevation scale lamp.
V23JA	3	Couplings, 1.....	On 1 conduit.....	Comm	For carriages with telephone.
V27P	2	Coupling nuts.....	On conduit (V27R).....	Bz	
V27C	1	Cover.....	For terminal box.....	CI	
V23BF	2	Crosses, 1.....	On left chassis and underneath right chassis.	Comm	
T85Q	1	Elbow.....	On 0.5 conduit on sight standard.	Bz	Part of plug connection.
V23CL	2	Elbows, side outlet.....	On left chassis.....	Comm	
V23BJ	1	Elbow, 0.75 90°.....	Inside rear transom near junction box (T25CB).	Comm	
T25BK	1	Gasket.....	For junction box (T25CB).....	SR	
E13P	1	do.....	For switch (E13AE3).....	SR	
V27E	1	do.....	For terminal box.....	GP	
	1	Gun outlet box.....	On left chassis.....		Furnished by Signal Corps.
E14C	1	Hook.....	On right chassis.....	Bz	For portable lamp.
T88U	1	Insulation tube.....	In racer near azimuth pointer.	HR	
T2D	1	Junction box.....	On left chassis.....	CI	
T24V1	1	do.....	Under right chassis.....	CI	
T24Q	1	Junction box cover.....	For junction box (T24V1).....	CI	
T2B	1	do.....	For junction box (T2D).....	CI	
T25CB	1	Junction box and cover.....	On racer in front of rear transom.	CI	
T24CA	1	do.....	On right chassis.....	CI	
E12NA	4	Lamps, candelabra.....	At elevation scale, azimuth pointer and buffer and recoil valves.	Comm	8 candlepower.
E20A	1	Lamp and cable, portable.....	Hung from right chassis.....		Furnished by Engineer Department.
E9H	2	Lamps, 2-candlepower.....	At telescopic sight.....	Comm	
E13AK	3	Lamps, 16-candlepower.....	At right and left chassis and inside rear transom.	Comm	For 110-volt main.
E13AL	3	do.....	do.....	Comm	For 220-volt main.
E13W1	1	Lamp fitting.....	For switch (E13AE3).....	CI	
E9B1	2	Lamp holders.....	For lamps (E9H).....	Bz	
E9G1	2	Lamp holder springs.....	On lamp holders (E9B1).....	Br	
E12Q1	1	Lamp springs.....	For lamps (E12NA).....	PhBz	

Names of parts of 6-inch disappearing carriage, L. F, model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

ELECTRICAL EQUIPMENT 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII—Contd.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
V23AU	1	Nipple, 2.5 long.....	In tee (V23AC).....	Comm	Insulation lined.
V23KU	1	Nipple, 3 long.....	In tee (V23JC).....	Comm	
V23LT	2	Nipples, close.....	In tee (V23AC) and junction box (T25CA).	Comm	Do.
V23UT	1	.....do.....	In elbow (V23CL).....	Comm	Right and left.
V23MT	1	.....do.....	In tee (V23JC).....	Comm	
V23AT	4	Nipples, short.....	In tees (V23AE) and junction boxes (T2D) (T25CB).	Comm	Insulation lined.
V23BT	4	.....do.....	In elbows (V23BJ) and (V23CL) and cross (V23BF).	Comm	Do.
V23HT	1	.....do.....	In junction box (T24V1)....	Comm	Right and left.
V23HT	1	Nipple, short.....	In bushing (V23MM).....	Comm	For carriages with telephone.
V23FT	3	Nipples, short.....	In junction box (T2D) and in coupling (V23AA).	Comm	Right and left.
V23GT	3	.....do.....	In cross (V23BF) and tees (V23JC).	Comm	Do.
E12T1	4	Nuts.....	Part of fittings of lamps (E12NA).	Bz	
E13H	1	.....do.....	For switch (E13AE3).....	Bz	
V27V	18	.....do.....	On bolts (V27T).....	Bz	
E12T1	1	.....do.....	On bushing (T85S).....	Bz	Part of plug connection.
V27D	1	Pad.....	For terminal box.....	SR	
	2	Pins.....	In pipe fitting (V27Q).....	S	
V27Q	1	Pipe fittings.....	On conduit (V27R).....	Bz	
V23B	5	Pipe plugs, 0.75.....	In tees (V23JC) (V23AE).....	Comm	
V23C	5	Pipe plugs, 1.....	In cross (V23BF) and terminal box.		Commercial.
V23A	3	Pipe plugs, 0.5.....	In junction box (T25AC) and tees (V23AC).	Comm	
V27L	1	Plate.....	For terminal box.....	Br	Marked Ordnance Department "wires" and Signal Corps "wires."
V27Z	6	Plates, marking.....	.....do.....	Br	Marked "L," "P," or "T."
T85AA	2	Plugs.....	On wire inside plug insulator (T85W).	Bz	Part of plug connection.
E20B	1	Plug box.....	On right chassis for portable lamp.		Furnished by Engineer Department.
T85L	1	Plug casing.....	In nut (E12T1).....	Bz	Part of plug connection.
T85W	1	Plug insulator.....	In plug casing (T85L).....	HR	Do.
E12P2	4	Reflectors.....	For lamps (E12NA).....	Br	
T25BM	6	Screws.....	In junction box (T25CA).....	S	0.25 by 0.5.
T88J	2	Screws, fillister head.....	In azimuth lamp bracket.....	S	0.375 by 1.25.
V27B	2	Screws, round head.....	For terminal box.....	Bz	0.375 by 1.
V27M	4	.....do.....	For plate (V27L).....	Br	0.1875 by 0.375.
	4	.....do.....	In junction-box cover (T2B).....	S	0.25 by 0.75.
T25BM	6	.....do.....	In junction box (T25CB).....	S	0.25 by 0.5.
T85V	1	Separator.....	In plug casing (T85L).....	HR	Part of plug connection.
T25CG	1	Shade.....	For lamp inside rear transom.....	S	Ends riveted in by 0.25 rivets.
T25BT2	2	Shades, complete.....	On right and left chassis....	S	Provided with thumb nuts.
T25CJ	1	Shade support.....	On rear transom.....	S	For shade (T25CG).
T25BY	2	Sleeves.....	Under junction box (T25CB).....	CI	
T85BA	2	Sockets.....	On wires inside socket insulator.	Bz	Part of plug connection.
E13AF	3	.....do.....	For 16-candle power lamps..	Comm	
E13AH	4	.....do.....	Attached to candelabra receptacle (E13AJ1).	Bz	For lamps (E12NA).
E13AG	3	Socket holders.....	For 16-candle power lamps..	Bz	
T85X	1	Socket insulator.....	In bushing (T85S).....	HR	Part of plug connection.
T91L	1	Straps.....	On 0.75 conduit on left chassis.	S	
T91J	3	.....do.....	On 1-inch conduit on right guide frame.	S	
T91N	1	.....do.....	On 0.5 conduit on left chassis.	S	
T91Q	1	.....do.....	On 0.5 conduit on front transom.	S	

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 Mm, their piece marks, location, and material of which they are made—Continued.

ELECTRICAL EQUIPMENT 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 Mm—Contd.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks.
T91G	1	Straps.....	On 0.75 conduit on inside right chassis.	S	For carriage with telephone.
T91C	9	.....do.....	For 0.5 conduit.....	S
T91E	1	.....do.....	On 1-inch conduit on racer.....	S
V27Y	1	.....do.....	On conduit (V27R).....	S
T91E	2	.....do.....	On 1-inch conduit from gun outlet box.....	S
E13M	1	Switch button, complete..	For switch (E13AE3).....	{VF and S	For elevating scale lamp.
E13H	1	Switch cover.....	Part of switch (E13AE3).....	Bz	
E13J2	1	Switch key.....	For switch (E13AE3).....	Bz	
E13A1	1	Switch, Perkins No. 2220..	Inside switch (E13AE3).....	Comm	
E13Q1	1	Switch, Russell.....	On left chassis.....	Comm	
E13AE3	1	Switch, watertight, complete.do.....		For elevating scale lamp.
T85T	1	Taper sleeve.....	In plug casing (T85L).....	Bz	
V23AC	3	Tees, 0.5.....	On 0.5 conduit on left chassis and front transom.	Comm	Part of plug connection.
V23HC	2	Tees, 0.75.....	On 0.75 conduit on right chassis.	Comm	
V23AE	2	Tees, reducing, 0.75 to 0.5..	On front transom and left chassis.	Comm	Furnished by Signal Corps, carriage No. 20 and above not equipped with telephone.
	1	Telephone.....	On left chassis.....	Comm	
V27S	12	Terminals.....	For terminal box.....	C	Part of plug connection. Insulated.
V27A	1	Terminal box.....	Under base ring.....	CI	
V27J	1	Terminal-box fitting.....	On conduit at terminal box.....	Bz	
E12Y	2	Twisted hooks.....	For holding cable thimbles.....	S	
E12Z	2	Washers.....	For twisted hooks (E12Y).....	S	
V27F	2	.....do.....	For terminal box.....	Bz
V27U	12	.....do.....	On bolts (V27T).....	Bz
T85Y	1	.....do.....	In elbow (T85Q).....	HR
		Wire, 200 feet.....	In conduit for lighting circuit	C	

SHOT TRUCKS (4 PER CARRIAGE), 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 Mm.

A1L	2	Angles.....	Bolted above main axle brackets (A1P).	S	1.75 by 1.75 by 0.1875 inches, angles.
A1T	2	.....do.....	Join angles (A1J) and (A1K) at top of truck.	S	1.5 by 1.5 by 0.1875 inches, angles.
A1U	2	.....do.....	Join angles (A1J) and (A1K) above caster wheels.	S	Do.
A1K	2	Angles, left.....	Front and rear vertical frames.	S	Do.
A1J	2	Angles, right.....	.....do.....	S	Do.
A1P	2	Axle brackets, main.....	At middle of truck.....	CS	Bolted between angles (A1L).
A1C1	1	Axle, main wheel.....	On main axle brackets (A1P)	FS	0.5 by 1.625.
A1X	4	Bolts, with nuts.....	In main axle brackets (A1P).	S	
A1S	2	Braces, left.....	Join front and rear vertical frames to main axle brackets.	S	1.5 by 1.5 by 0.1875 inches, angles.
A1R	2	Braces, right.....	.....do.....	S	Do.
A1B	2	Bushings.....	Main wheels (A1A).....	Bz	
A1E	2	.....do.....	Caster wheels (A1D).....	Bz	1.5 by 1.5 by 0.1875 inches, angles.
A1Q	1	Handle.....	Rear end of truck.....	Ash	
	2	Nuts, crown.....	On main wheel axle.....	S	Supported in bearing in lower end of angles (A1J) and (A1K).
Q3C	4	Oil plugs, 0.375 standard..	In wheel.....	Bz	
A1F	2	Pins, caster wheel.....	Supported in bearing in lower end of angles (A1J) and (A1K).	S	0.25-inch diameter.
	2	Rivets.....	For handle.....	S	
	4	Rivets, round head.....	Angles (A1) to shot supports.	S	
	24	.....do.....	At various joints.....	S	0.375-inch diameter.
A1H	1	Shot support, left.....	Top of truck.....	S	2 by 2 by 0.25-inch angle.

Names of parts of 6-inch disappearing carriage, L. F., model of 1905 MII, their piece marks, location, and material of which they are made—Continued.

SHOT TRUCKS (4 PER CARRIAGE), 6-INCH DISAPPEARING CARRIAGE, MODEL OF 1905 MII—Continued.

Piece mark.	Num-ber.	Name of part.	Location.	Material.	Remarks
A1G	1	Shot support, right.....	Top of truck.....	S	2 by 2 by 0.25-inch angle.
	2	Split pins.....	In caster wheel pins.....	S	
	2	do.....	In taper pins.....	S	
	2	do.....	In crown nuts.....	S	For main axle.
A1N	1	Stop, left.....	On shot support.....	S	On main axle.
A1M	1	Stop, right.....	do.....	S	
	2	Taper pins.....	In main axle brackets.....	S	
A1W	2	Tires.....	Caster wheels.....	VR	
A1V	2	do.....	Main wheels.....	VR	
	2	Washers.....	In main axle.....	S	
A1D	2	Wheels, caster.....	On caster wheel pins. Front and rear of truck.	CS	
A1A	2	Wheels, main.....	On main axle.....	CS	

SHOT TONGS, MODEL OF 1904 (7 PER CARRIAGE).

A8N1	1	Claw, inner.....	Opposite outer claw (A8P).....	S	In two parts.
A8P	1	Claw, outer.....	Pivoted on center pin (A8T).....	S	Do.
A8S	1	Dog.....	do.....	S	
A8T	1	Pin, center.....	For pivot of claws and dog.....	S	
A8Q	1	Pin, shackle.....	In upper of extremity of outer claw.	S	
	3	Separators.....	Between 2 parts of inner claw.	S	
	2	do.....	Between 2 parts of outer claw.	S	Riveted to claw.
A8R	1	Shackle.....	On shackle pin (A8Q).....	S	
	2	Split pins.....	In shackle pin.....	S	
	2	do.....	In center pin.....	S	
	1	Spreader.....	In inner claw (A8N1).....	S	Do.
	1	do.....	In outer claw (A8P).....	S	Do.

GREASE CUPS (10 PER CARRIAGE) 6-INCH DISAPPEARING CARRIAGE, MODEL 1905 MII.

A2A	1	Body.....	Screwed into carriage.....	Bz	
A2B	1	Cap.....	On upper end of body (A2A).....	Bz	
A2D1	1	Cup, leather.....	Underneath plunger.....	Leather.	
	2	Gaskets.....	Between body (A2A) and oil pipe when grease cup is seated.	C	
	1	Pin.....	In plunger.....	Bz	0.125 by 0.5 driven.
A2E1	1	Plunger.....	Inside grease cup.....	Bz	
A2G	1	Plunger nut.....	Secures plunger to cap (A2B).....	Bz	
A2H	1	Screw.....	Secures cup leather to plunger.	Bz	
	1	Split pin.....	In plunger nut.....	S	
A2F	1	Spring.....	Between cap and plunger.....	S	5 coils.
A2C1	1	Washer.....	Under cup leather.....	Bz	

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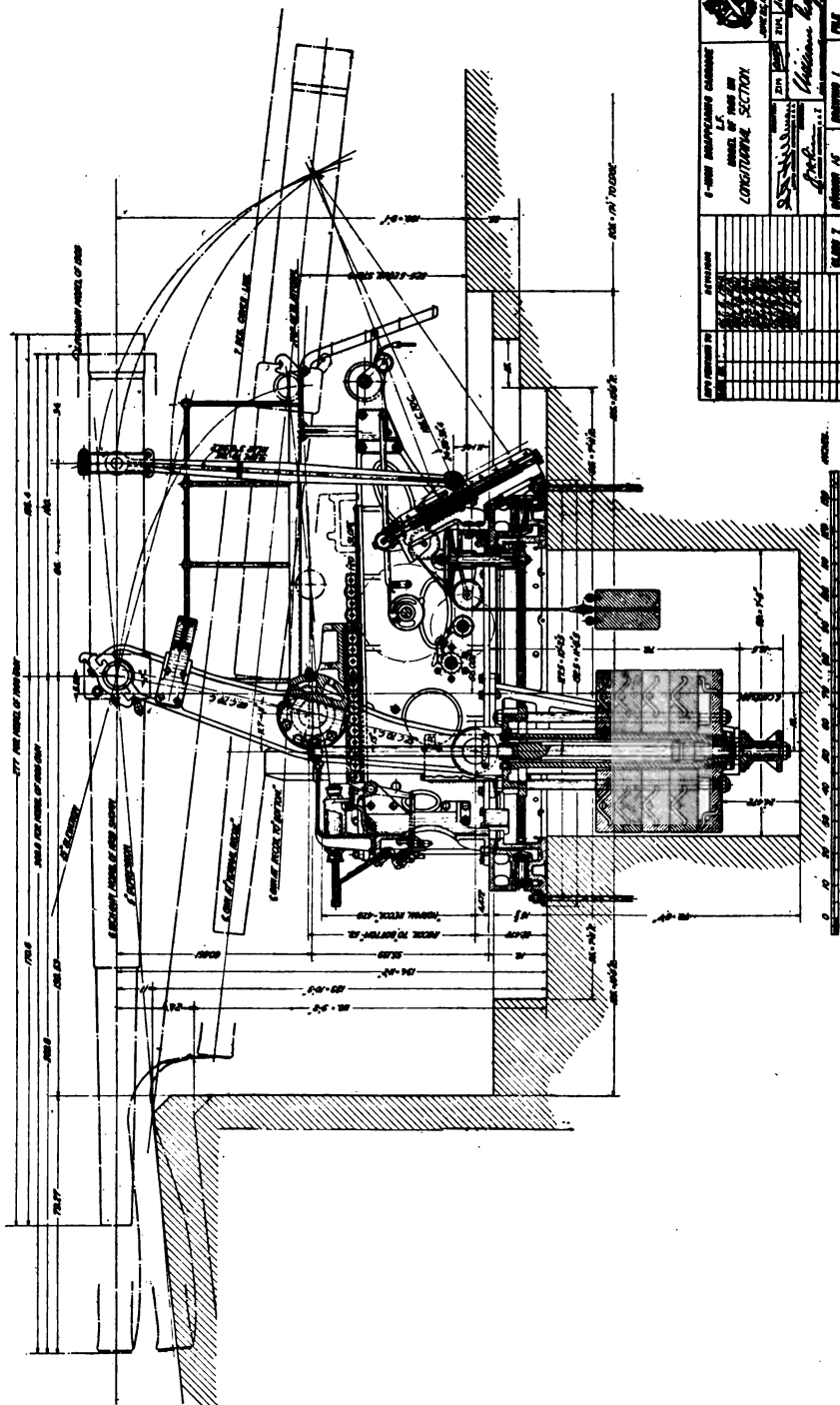
Washington, January 14, 1914.


FORM No. 1711.

Ed. Aug. 24-17—1,000.

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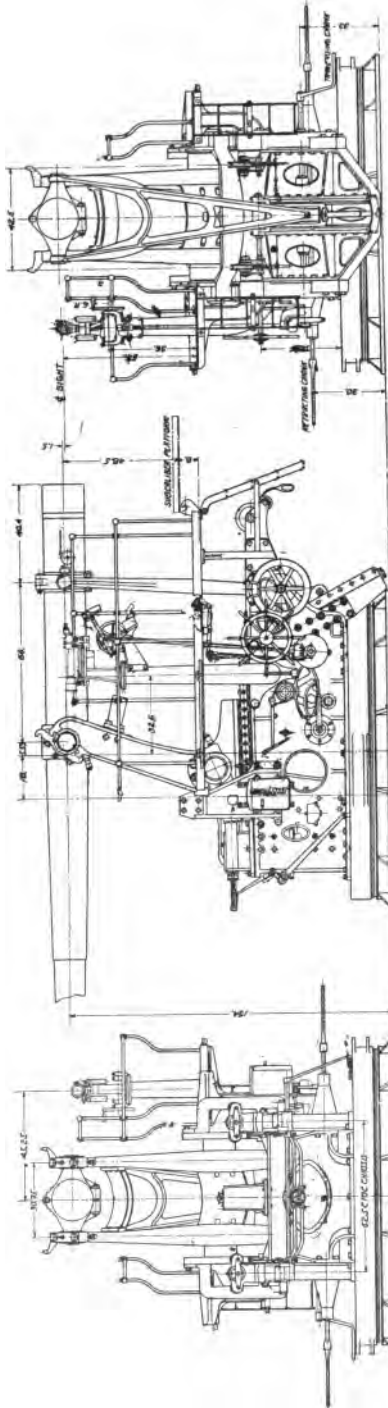
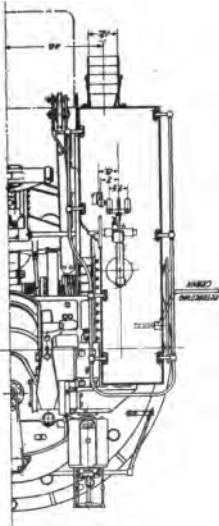
PLATE II




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DESIGNED BY J. H. P.	DRAWN BY J. H. P.	CHECKED BY J. H. P.	APPROVED BY J. H. P.
DATE 1900-1901		SCALE 1" = 1"	
SHEET 1		TOTAL SHEETS 1	

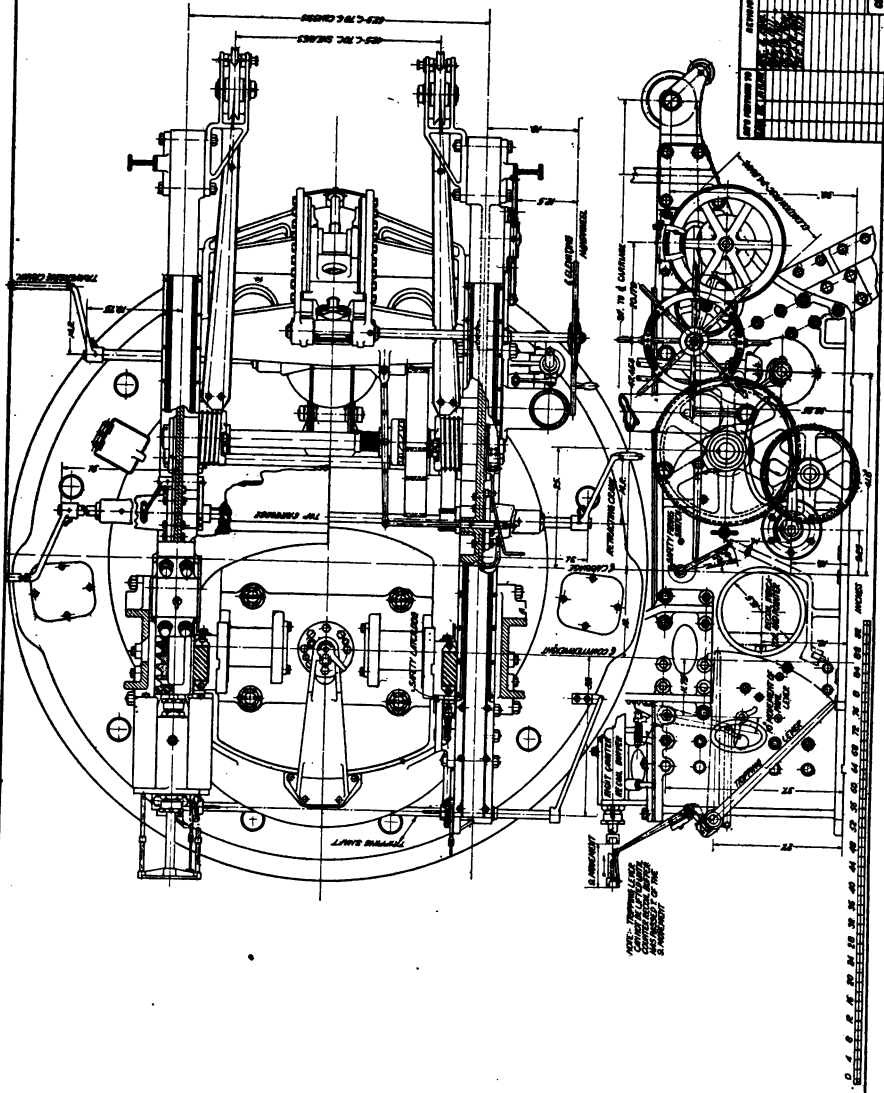
UNIVERSITY OF CALIFORNIA

PLATE III

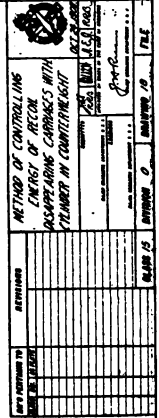


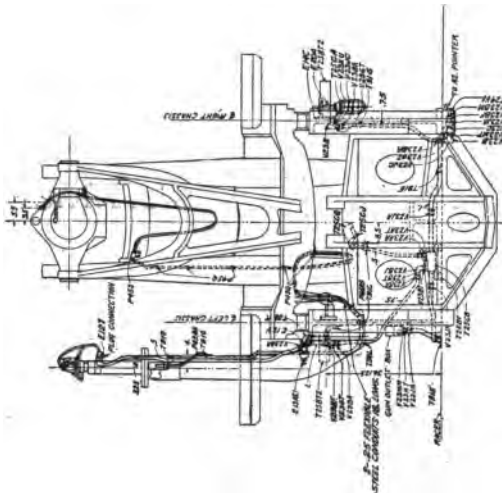
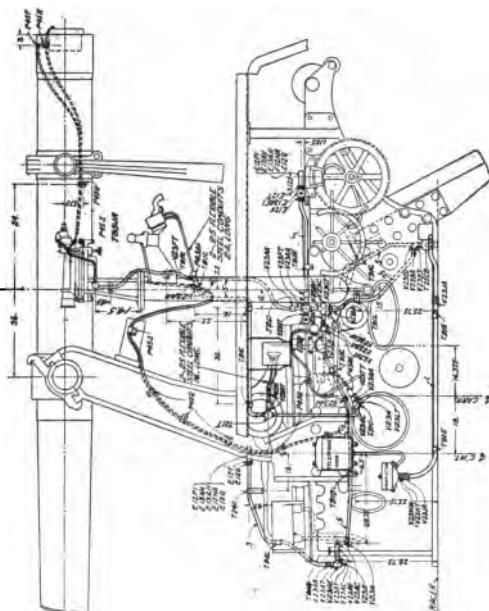
		8-INCH REAPPEARING CAMERA MODEL L 1938 BY ASSIGNED 13 17045		DRAWN BY DATE CHECKED BY DATE	CLASS 3 DIVISION 15 DRAWING 2	FILE
REVIEWED BY DATE		APPROVED BY DATE		CLASS 3 DIVISION 15 DRAWING 2		FILE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 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2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 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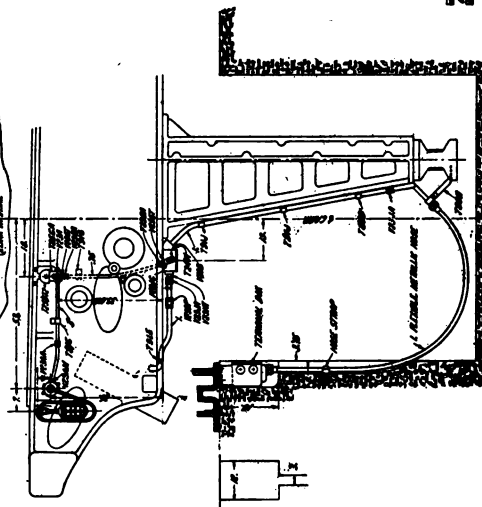
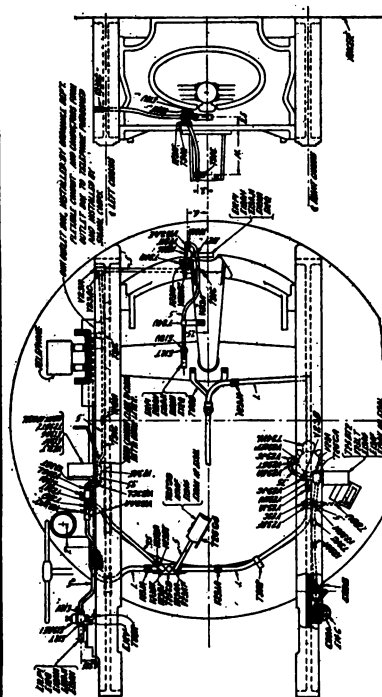
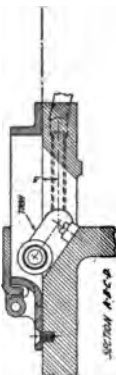
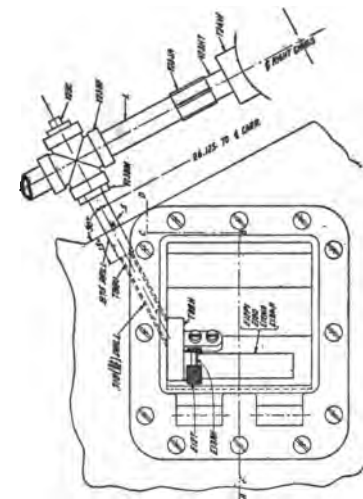


U.S. DEPARTMENT OF COMMERCE BUREAU OF STANDARDS DIVISION OF MECHANICAL ENGINEERING	
DESIGNER	W. L. RAY
DATE	1914
BY	W. L. RAY
CHECKED BY	W. L. RAY
APPROVED BY	W. L. RAY
CLASS	CLASS 1
SECTION	SECTION 1
FIGURE	FIGURE 1
FILE	FILE



[illegible]

A vertical ruler with markings from 0 to 30 inches. The markings are in inches, with major ticks every 1 inch and minor ticks every 1/2 inch. The ruler is oriented vertically with the 0 inch mark at the bottom and the 30 inch mark at the top.

[illegible]

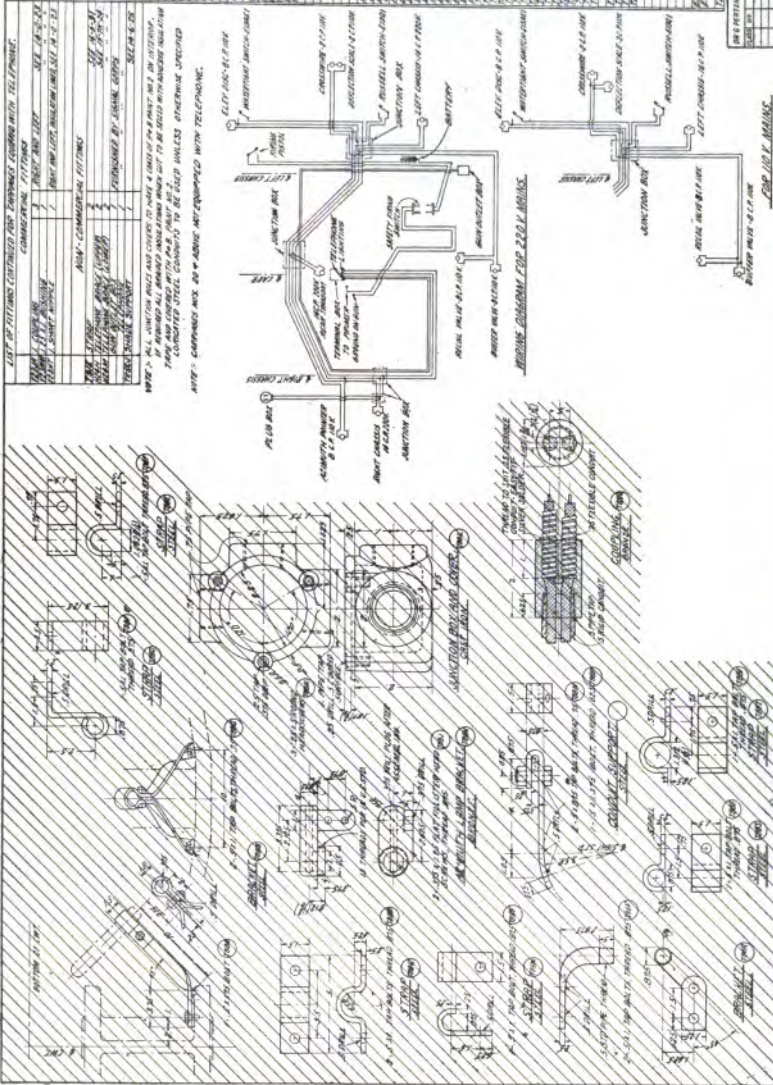
[illegible][illegible]

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains.

Gaylord Bros.
Makers
Syracuse, N. Y.
PAT. MAR. 21 - 1906

